



WTC 2017

THE 6th WORLD TRIBOLOGY CONGRESS

September 17 - 22, 2017 • Beijing, China

PROGRAMME





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WELCOME TO WTC 2017

The Sixth World Tribology Congress (WTC 2017), organized by the Chinese Tribology Institute (CTI), will be held in Beijing, China, on September 17-22, 2017.

The objective of this congress is to highlight recent important progress in all aspects of tribology and strengthen the links between academia and industry by exploring various researches on fundamental and applied Tribology. Presentations, exhibition and networking at WTC2017 are designed to broaden knowledge and provide a range of perspectives on topics as diverse as Science of Tribology, Wear & Surface Engineering, Lubrication and Lubricants, Biotribology & Biomimetics, Tribology in Manufacturing, Engine and Transmission Tribology, Industrial Tribo-systems, Tribotest and Monitoring, and Tribology in future.

More than 900 oral presentations and over 300 poster presentations have been accepted inside 9 Tracks and organized into 170 oral sessions and 2 poster sessions. An Opening Ceremony and Plenary Lectures are planned on the morning of the first day. Some Keynote Speeches and Invited Talks are included in the oral sessions. A technical exhibition and some visits to the State Key Laboratory of Tribology (SKLT) at Tsinghua University are organized.

When 1500 scientists and researchers representing 51 countries come to Beijing between September 17th and 22th, 2017, they will experience an innovative and updated version of the WTC congress, following the very well attended sessions in Torino (2013), Kyoto (2009), Washington DC (2005), Vienna (2001), London (1997).

We are honored to have you in Beijing, as Beijing is famous of being a modernized historic city, facilitated with world-class convention centers, hotels and resorts which will serve WTC 2017 with a high level horizon!

With our warmest welcome!

**Chair**

Prof. Dr. Jianbin Luo
Tsinghua University
China

**Co-chair**

Prof. Dr. Weimin Liu
*Lanzhou Institute of Chemical Physics of the
Chinese Academy of Sciences*
China

**Co-chair**

Prof. Dr. Shirong Ge
China University of Mining and Technology
China

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COMMITTEES *& ORGANIZERS*



ORGANIZING COMMITTEE

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Chinese Academy of Sciences

Shirong Ge *China University of Mining and Technology*

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Yu Tian *Tsinghua University*

Deputy Secretary General

Feng Zhou *Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences*

Xiuqin Bai *Wuhan University of Technology*

Yong Luo *China University of Mining and Technology*

Chenhui Zhang *Tsinghua University*

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PROGRAM COMMITTEE

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TRACK ORGANIZERS

Track 1 Science of Tribology

Organizer: Mark Robbins

Co-organizers:

Yonggang Meng, Antonius Lubrecht, Quanshui Zheng, Daniel Nelias, Hiroshi Matsukawa, Zhendong Dai, Feng Zhou

Track 2 Wear & Surface Engineering

Organizer: Ali Erdemir

Co-organizers:

Tianmin Shao, Izhak Etsion, Kenneth Holmberg, Haidou Wang

Track 3 Lubrication and Lubricants

Organizer: Hugh A. Spikes

Co-organizers:

Weimin Liu, Yuanzhong Hu, Roland Larsson, Mori Shigeyuki, Pingyu Zhang

Track 4 Biotribology & Biomimetics

Organizer: John Fisher

Co-organizers:

Shirong Ge, Ming Zhou, Yoshinori Sawae, Philippa M. Cann, Zhongmin Jin, Zhongrong Zhou

Track 5 Tribology in Manufacturing

Organizer: Dohda Kuniaki

Co-organizers:

Kun Liu, Xinchun Lu, Satish V. Kailas

Track 6 Tribology in Manufacturing

Organizer: Victor Wong

Co-organizers:

Dong Zhu, Simon Tung, Michel Fillon, Wei Chen, Liqin Wang

Track 7 Industrial Tribo-systems

Organizer: Georg Jacobs

Co-organizers:

Yongzhen Zhang, Jian Li, Mitjan Kalin, Dan Guo, George Totten,
Qian Zou

Track 8 Tribotest and Monitoring

Organizer: Takahisa Kato

Co-organizers:

Gwidon Stachowiak, Xinping Yan, Braham Prakash, Jose Daniel
Biasoli de Mello, Jun Xiao, Chenhui Gao, Jiadao Wang, Xiangjun
Zhang

Track 9 Forum of Young Tribologists-Organized by CTI & STLE

Organizer: Yu Tian, David Burris

Co-organizers:

Haosheng Chen, Linmao Qian, Martin Dienwiebel, Markus
Valtiner



GENERAL INFORMATION



CONGRESS VENUE

Beijing International Convention Center (BICC)

The Beijing International Convention Center is a well-known enterprise in Beijing. Opened in 1990, the convention center has served almost 1,000 different international and domestic conventions, exhibitions and meetings each year since its conception.

In 2002 the convention center merged together under North Star Industrial Group, creating a stronger reputation with more effective management. The Center is situated on the site of the Asian Games Village, a flourishing area of Beijing which has a collection of conference centers, businesses, shopping centers and entertainment venues. It is located on the North Fourth Ring road, just 20 kilometers from the International Capital Airport and 9 kilometers from the city center. The Center is also very close to the Olympic Games central area, including the Bird's Nest.

The Beijing International Conference Center provides 5 star services and comprises 48 different conference rooms. The exhibition hall is 5,000 square meters. The North Star Continental Grand Hotel is a 4 star hotel with 538 guest rooms and 5 restaurants serving different types of cuisine. It's the ideal place to conduct international and domestic conferences, display cultural events and hold business meetings.

www.bicc.com.cn



HOW TO GET TO THE BEIJING INTERNATIONAL CONVENTION CENTER (BICC)?

From Beijing Capital Airport to BICC



(1) Taxi

Beijing Capital International Airport provides taxi stations at the airport, so you can take a taxi from the airport to the congress venue.

Taxi Locations:

Terminal 1: Outside Gate 1 on F1

Terminal 2: Outside Gate 5 to 9 on F1

Terminal 3: Please refer to the signs inside the terminal building

Fare: About RMB 120 (USD \$ 20 including toll). The cost is subject to change depending on actual traffic conditions.



(2) By Airport Shuttle

Take the Airport Shuttle Bus Line 5 (to Zhongguancun) and get off at Asian Games Village (Anhui Bridge) station, then Public Bus No.419 to Wali South station. Then walk towards the south for about 400 meters to the BICC.

Fare: RMB 24 (USD \$4)



(3) By Airport Express

1. Airport Express (get off at Sanyuanqiao)-Subway Line 10(get off at Anzhenmen)-Public Bus No.380(get off at Anhuiqiao Bei)

2. Airport Express (get off at Sanyuanqiao)-Subway Line 10(get off at Beitucheng)-Subway Line 8(get off at Aotizhongxin)



From Railway Station to BICC



1. From Beijing Railway Station to BICC

- 1) Subway Line 2 (get off at Gulou Dajie)-Subway Line 8 (get off at Aotizhongxin)
- 2) Public Bus No. 387 (get off at Anhuqiao Bei)
- 3) Subway Line 2 (get off at Andingmen)-Public Bus No. 426 (get off at Anhuqiao Bei)
- 4) Subway Line 2 (get off at Guloudajie)-Subway Line 8 (get off at Aotizhongxin)
- 5) Special Public Bus No. 2 (get off at Anhuqiaobei)

2. From Beijing West Railway Station

- 1) Subway Line 9 (get off at National Library)-Subway Line 6 (get off at Nanluoguxiang) - Subway Line 8 (get off at Aotizhongxin)
- 2) Public Bus No. 9 (get off at Zhengyilu)-Special Public Bus No. 11 (get off at Anhuqiaobei)
- 3) Public Bus No. 387 (get off at Anhuqiao Bei)

3. From Beijing South Railway Station

- 1) Subway Line 4 (get off at Xisi)-Public Bus No. 124 (get off Anhuqiao Bei)
- 2) Subway Line 4 (get off at Pinganli)-Special Public Bus No. 13 (get off at Qijiahuozi)-Public Bus No. 658 (get off at Yayuncun)
- 3) Subway Line 4 (get off at Xuanwumen)-Subway Line 2 (get off at Andingmen)-Public Bus No. 426 (get off at Anhuqiao Bei)
- 4) Subway Line 4 (get off at Xuanwumen)-Subway Line 2 (get off at Guloudajie)-Subway Line 8 (get off at Aotizhongxin)

Remarks:

1. You may change money at the Banks or Money Exchange at the airport beforehand since you need Chinese money (RMB) to pay for the means of transportation.
2. There will be quite some walk with ups and downs especially at the subway station for transfers if you choose to go to BICC by either airport shuttle, airport express or subway. Our previous conference delegates complained a lot about the inconveniences caused by taking airport express and subway, so it is preferred that you go to BICC by taxi.

LIABILITY

The organizers cannot accept liability for any personal accidents, loss of belongings or damage to private property of participants and accompanying persons that may occur during the Congress.

CURRENCY, EXCHANGE AND CREDIT CARDS

The currency used in China is the Renminbi Yuan (RMB or ¥).

Euros and US Dollars can be exchanged at your hotel or at any bank. Traveller's cheques can only be exchanged at the Bank of China.

Banks usually open from 9 a.m. to 5 p.m. From Monday to Friday and 9 a.m. to 4 p.m. on Saturday and Sunday.

Credit cards are very common. It is advisable to carry some cash, since for small purchase shops do prefer to be paid by cash.

ELECTRICITY

The electric current used in China is 220V 50Hz. Hotels provide 220V and 110V (shavers only) power outlets. Please note that plug adapters and converters might be required.

TIPPING

Gratuities are not customary in China. However, in hotels and during group travels, tipping is practiced for porters, tour guides and drivers.



SMOKING

Smoking in indoor public places has been banned in Beijing from June 1, 2015 following the rolling out of the toughest ever antismoking regulation in China. The regulation extends smoking bans to include all indoor public areas and workplaces, plus a number of outdoor areas including schools, seating areas in sports stadiums and hospitals where women or children are treated.

TIME

China covers four time zones. Beijing time is the only official time throughout the country; punctuality is highly appreciated.

TRANSPORTATION

Public Buses

Buses are the main means of transport in Beijing. Please prepare small bills as not all buses will carry change. Buses can be very crowded during peak times, which are generally from 7-9 a.m. and 4-6 p.m.

The Subway

The subway system in Beijing has 15 lines. The fare is 3 - 9 yuan. Trains run from 5:30 in the morning until 11:00 in the evening. A ticket can be bought at the ticket office at each station or at an automatic ticketing machine. Subway stops are announced over the train's speaker system in Chinese and English.

Taxis

Taxis in Beijing have several colours. All of them show a taximeter inside. You can easily find them in every part of Beijing. All Taxis will charge 2.3 yuan per kilometer with a base rate or minimum charge of 13 yuan.



ACCOMMODATION

Several recommended hotels nearby BICC are listed as following:

Hotel 1	NORTH STAR YAYUNCUN HOTEL (北辰亚运村宾馆)
Room Type	Standard Room (Twin beds/King bed)
Room Rate	300 RMB
Remark	The room rate includes 1 or 2 breakfast, service charge and taxes
Dist. to BICC	15 minutes walk
Internet	Free WIFI
Introduction	With both Asian Games village and Olympic Park as its neighbors, Yayuncun Hotel is only few minutes walking distance from the "Bird's Nest"
Shuttle	Not Available
Contact	Mr. Zhou Bin E-mail: zhoubin8522@qq.com Tel: 0086 186 1125 0221

Hotel 2	NORTH STAR HUIYUAN PRIME HOTEL (北辰汇园酒店公寓贵宾楼)
Room Type	Standard Room (Twin beds) One Bedroom Suite (Twin beds/King bed) Two-Bedroom Suite (1 king bedroom and 1 twin bedroom)
Room Rate	660 RMB 760 RMB 980 RMB
Remark	The room rate includes 1 or 2 breakfast, service charge and taxes.
Internet	Free WIFI
Introduction	Huiyuan Prime Hotel is only 27 km to Capital International Airport and 20 km to Beijing West Railway Station. The hotel offers easy access to the neighboring key destinations, like Minzu Park.
Dist. to BICC	15 minutes walk
Shuttle	Not Available
Contact	Mr. Zhou Bin E-mail: zhoubin8522@qq.com Tel: 0086 186 1125 0221

Hotel 3	BEIJING CONTINENTAL GRAND HOTEL (五洲大酒店)
Room Type	Deluxe Room (Twin beds/King bed)
Room Rate	770RMB
Remark	The room rate includes 1 or 2 breakfast, service charge and taxes
Internet	Free WIFI
Introduction	Beijing North Star Continental Grand Hotel is a large four star hotel with 538 elegant and comfortable rooms. The guest rooms are renovated recently, representing advanced technology which demonstrates the international quality and hospitality
Dist. to BICC	Sharing the same building with BICC

Shuttle	Not Available
Contact	E-mail: yudingbu@bicc.com.cn Tel: 0086 10 8498 0105

Hotel 4	V-CONTINENT BEIJING PARKVIEW WUZHOU HOTEL (北辰五洲皇冠国际酒店)
Room Type	Superior Room (Twin beds/King bed)
Room Rate	1020 RMB
Dist. to BICC	5 minutes walk
Internet	Free WIFI
Introduction	V-Continent Beijing Parkview Wuzhou Hotel is adjacent to the Beijing International Convention Center, one kilometer from Olympic Park and eight kilometers from Beijing city center.
Shuttle	Not Available
Contact	E-mail: reservation@v-continent.com Tel: 0086 10 64817138

Hotel 5	CELEBRITY INTERNATIONAL GRAND HOTEL (北京名人国际大酒店)
Room Type	Standard Room (Twin beds/King bed) Business Suite (Twin beds/King bed)
Room Rate	700 RMB 880 RMB
Remark	The room rate includes 1 or 2 breakfast, service charge and taxes
Dist. to BICC	25 minutes walk
Internet	Free WIFI
Introduction	The 25-story Celebrity International Grand Hotel is located just north of the Anhui Bridge over North Fourth Ring Road in Beijing. It is about three blocks from a subway station and 25 kilometers from Capital Airport.
Shuttle	Not Available
Contact	E-mail: 13581773237@126.com Tel: 0086 10 5865 1166 ext 6116

Hotel 6	NORTH STAR YUANCHENXIN INTERNATIONAL HOTEL (北辰元辰鑫国际酒店)
Room Type	Standard Twin bed Room
Room Rate	580 RMB
Remark	The room rate includes 1 or 2 breakfast, service charge and taxes
Dist. to BICC	Take the Bus 658 from Jiandemen Bridge North Station to Yayuncun Station
Internet	Free WIFI



Introduction Yuanchenxin International Hotel, is a four star business hotel. It is located at the northern area of the city, right at the junction of the North 3rd Ring Road and the Expressway linking to Badaling Great Wall, convenient to the relic of the capital of the Yuan dynasty in ancient China, and adjoin the China International Science Technology Convention Center(CISTCC).

Shuttle Not Available

Contact E-mail: zhaogurong_1314@126.com

Tel: 0086 10 8225 0362 +86 15910973379



① North Star Yayuncun Hotel

② North Star Huiyuan Prime Hotel

③ Beijing Continental Grand Hotel

④ V-Continent Beijing Parkview Wuzhou Hotel

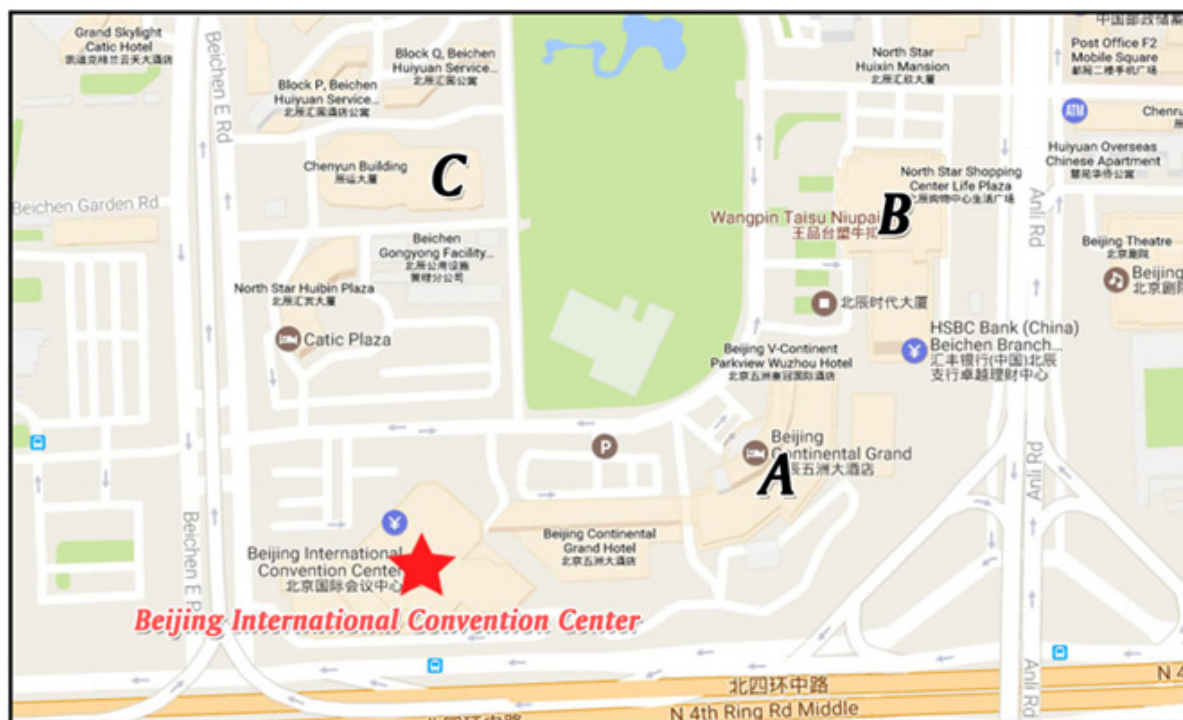
⑤ Celebrity International Grand Hotel

⑥ North Star Yuanchenxin International Hotel



DINING

You can have meals at the restaurants nearby the Beijing International Convention Center.



A:Café Asia, Yue Feng Ge Chinese Restaurant, Brazilian Churascos

B:Subway, Burger King, Starburks, Ajisen Ramen and some Chinese local restuarants

C:Chinese local restuarants and cafes

***The walking distance from BICC to the recommended dining areas**

1. 5 minutes walking to the A
2. 10-15 minutes walking to the B & C

INSTRUCTIONS FOR LECTURES AND ORAL PRESENTATION

Speakers have two options to present their talks.

- A. Speakers are encouraged to upload their files to the Slide Centre the day before, if the presentation is in a morning session, or at least 2 hours before the beginning of the session, in the case of an afternoon session.
- B. Speakers can also use their own computers to present. Please bring an appropriate adapter with you.

Microsoft PowerPoint Windows-Office 2013/2017 will be recommended to present your talk..

If you have a Macintosh computer, please bring an appropriate converter with you.

INSTRUCTIONS FOR POSTER PRESENTATION

Poster will be displayed divided into 2 sessions:

Time: 15:30 - 16:30, 19 September Venue: Lounge Area, Level 3

Time: 15:30 - 16:30, 20 September Venue: Lounge Area, Level 3

Authors are invited to hang their posters the day of their presentation preferably half hour before the session start.

Authors must guarantee their presence nearby the poster during the time of their presentation. Poster size is 120cm (height) and 90cm (width). Modality to stick the poster: adhesive tape. Pins are not usable.

Adhesive tapes and scissors will be available at the Registration Desk.



LABORATORY VISIT

To enhance a broad and in-depth exchange in academic field, the Organizing Committee of the 6th World Tribology Congress decided to arrange a visit to the State Key Laboratory of Tribology (SKLT) at Tsinghua University.

The SKLT at Tsinghua University was established in 1986. Accredited by the state and open to the public in November 1988, it was one of the earliest State Key Laboratories at Tsinghua University, also in the field of mechanical engineering in China. The SKLT serves as a leading scientific research platform in the fields of tribology, surface and interface sciences, bio-tribology and bio-mechanics, micro/nano manufacturing theory and technology and micro/nano photoelectronic measurement technology. It also carries out related technology development and consultation service.

Optional Time Schedule:

20th Sept. 2017 (Wednesday)

13:00-15:00 including round way transfer, pick up and return point is BICC Lobby.

14:00-16:00 including round way transfer, pick up and return point is BICC Lobby.

15:00-17:00 including round way transfer, pick up and return point is BICC Lobby.

16:00-18:00 including round way transfer, pick up and return point is BICC Lobby.

22nd Sept. 2017 (Friday)

13:00-15:00 including round way transfer, pick up and return point is BICC Lobby.

14:00-16:00 including round way transfer, pick up and return point is BICC Lobby.

15:00-17:00 including round way transfer, pick up and return point is BICC Lobby.

16:00-18:00 including round way transfer, pick up and return point is BICC Lobby.

Attention: With regard to the acceptance capacity and making you a better experience, SKLT plans to accommodate totally 200 persons' visit each afternoon. Please enjoy the visit according to your pre-registration.

TOURS

We would like to recommend two full day tours on 23rd Sept. and 24th Sept. separately. For the detail please refer to the information below.

Tour Code	Price/per person	Description	Date Schedule
FDT-170923-01	US\$150.00	Morning: Tian'an Men Square and the Forbidden City and lunch at local Restaurant. Afternoon: Hutong Tour, dinner is on own	23rd Sept. 2017
FDT-170923-02	US\$170.00	Morning: Temple of Heaven and lunch at Local Restaurant Afternoon: Badaling Great Wall, dinner is on own	
FDT-170924-01	US\$150.00	Morning: Tian'an Men Square and the Forbidden City and lunch at local Restaurant. Afternoon: Hutong Tour, dinner is on own.	24th Sept. 2017
FDT-170924-02	US\$170.00	Morning: Temple of Heaven and lunch at Local Restaurant. Afternoon: Badaling Great Wall, dinner is on own.	

Remarks:

1. The cost is based on a group of minimum 2 paying guests.
2. The cost includes a private English speaking guide & a private vehicle, entrance fee and lunch (excluding drinks) at local restaurant.



Cultural Tour Recommendation For The 6th World Tribology Congress

Two Optional Tours Each Day on 23rd and 24th Sept. 2017

Optional 1

Tour Code:

FDT-170923-01 on 23rd Sept. 2017

FDT-170924-01 on 24th Sept. 2017

Morning: Tian'an Men Square and the Forbidden City

Lunch: Local Restaurant

Afternoon: Hutong Tour

Dinner is on own

Hour by Hour Schedule

08:30-09:30 Transfer from Beijing Continental Grand Hotel (Lobby) to the Tian'an Men Square

09:30-12:00 Visit to the Tian'an Men Square and the Forbidden City

12:00-12:30 Transfer to the Local Restaurant for lunch

12:30-13:30 Lunch at the Local Restaurant

13:30-15:30 Visit to the Hutong Area incl. rickshaw ride and family visit

15:30-16:10 Transfer back to the Beijing Continental Grand Hotel

Remarks:

The cost is based on a group of minimum 2 paying guests.

US\$150 per person The cost includes a private English speaking guide & a private vehicle, entrance fee and local lunch (excluding drinks) at local restaurant



A Hutong is a unique form of community that exists only in China. The Hutong, built during the Yuan, Ming, and Qing dynasties, is the narrow network of lanes created by closely built quadrangular homes. The houses and courtyards, hidden away and boxed, are closed off with wooden gates that often have carved characters intended to bring good fortune to the house owner.

Optional 2

Tour Code:

FDT-170923-02 on 23rd Sept. 2017

FDT-170924-02 on 24th Sept. 2017

Morning: Temple of Heaven

Lunch: Local Restaurant

Afternoon: Badaling Great Wall

Dinner is on own

Hour by Hour Schedule

08:30-09:30 Transfer from Beijing Continental Grand Hotel (Lobby) to the Temple of Heaven

09:30-12:00 Visit to the Temple of Heaven

12:00-12:30 Transfer to the Local Restaurant for lunch

12:30-13:30 Lunch at the Local Restaurant

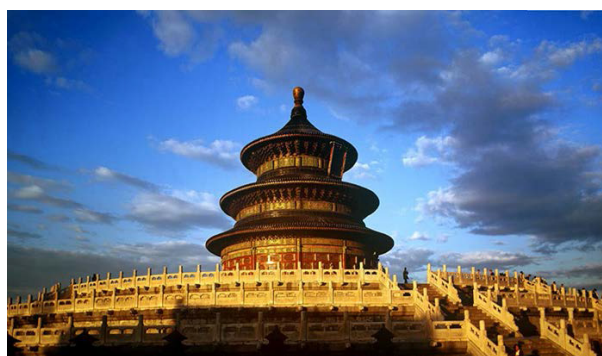
13:30-15:30 Visit to the Badaling Great Wall

15:30-16:10 Transfer back to the Beijing Continental Grand Hotel

Remarks:

The cost is based on a group of minimum 2 paying guests.

US\$150 per person The cost includes a private English speaking guide & a private vehicle, entrance fee and local lunch (excluding drinks) at local restaurant





OPENING CEREMONY ***& PLENARY TALKS***

OPENING CEREMONY

9:00-10:00 Monday 18th September- CONVENTION HALL No.1

PLENARY TALKS

CONVENTION HALL No.1

Monday 18th September

10:20-11:00

Tribology for Space Technology

Prof. Weimin Liu

Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, China

11:00-11:40

Biolubrication: Beyond Tribology

Prof. Jacob Klein

Weizmann Institute of Science, Israel

Tuesday 19th September

8:30-9:10

Advances in Tribological Coatings for More Efficient and Green Transportation Technologies

Prof. Ali Erdemir

Argonne National Laboratory, United States

9:10-9:50

Recent Lubrication Research Activities in SKLT

Prof. Yonggang Meng

State Key Laboratory of Tribology, Tsinghua University, China

Wednesday 20th September

8:30-9:10

Multiphysic Interfaces of Contact and Relative Motion

Prof. Qian Jane Wang

Northwestern University, United States

9:10-9:50

Influence of Tribology on Global Energy Consumption, Costs and Emissions

Prof. Kenneth Holmberg

VTT Technical Research Centre of Finland, Finland

Thursday 21st September

8:30-9:10

Stress-Induced Thermal Activation in Tribology: From Rheology to Tribochemistry

Prof. Hugh A. Spikes

Imperial College London, United Kingdom

9:10-9:50

Tribology and Materials for Hydrogen Energy (Society)

Prof. Joichi Sugimura

Kyushu University, Japan

PLENARY SPEAKERS

Weimin Liu



Weimin LIU, received his Ph.D. in lubricating materials and Tribology from Lanzhou Institute of Chemical Physics (LICP) of the Chinese Academy of Sciences in 1990. After that, he joined the State Key Laboratory of Solid Lubrication (LSL) of the LICP. From June 1993 to June 1994, he worked as a Visiting Scholar at Pennsylvania State University, USA. In 2013, he was elected the Member of the Chinese Academy of Sciences. In 2016, he was elected the Fellow of The World Academy of Sciences (TWAS). Currently, he is head of the State Key Laboratory of Solid Lubrication, and one of the Editor of journal of Tribology International.

Prof. LIU has been working in tribology for over 30 years and made great contributions to develop advanced lubricating materials for China's space, aviation and heavy duty industries in which lubrication is the key to guarantee long term service of moving components. Up to now, he has published more than 600 papers with citation over 21000 times. He holds 80 Chinese patents and 1 US patent; won 2 National Awards for Natural Sciences (second class) and 2 National Awards for Technological Invention (second class). He is the winner of the Ho Leung Ho Lee Foundation Materials Prize of 2016. His research interests mainly focus on space and aviation lubrication, high performance lubricating materials and Tribochemistry.

Jacob Klein



Jacob Klein, born 1949, is the Herman Mark Professor of Polymer Physics at the Weizmann Institute in Israel. Klein gained his BA in Physics at the University of Cambridge, where in 1977 he also received his M.A. and PhD at the Cavendish Laboratory. He did his postdoc at the Weizmann Institute in Israel, and from 1980-1984 was a Senior Scientist at the Weizmann Institute and a University Demonstrator at the Cavendish Laboratory. In 1984 he was appointed Professor at the Weizmann Institute (full Professor from 1987), and subsequently headed its Polymer Research department and was Chairman of its Scientific Council. From 2000-2007 Klein was the Dr. Lee's Professor of Chemistry at the University of Oxford and Head of its Physical and Theoretical Chemistry Laboratory (2000-2005). His interests in soft matter have ranged from the dynamics and interfacial properties of polymers to the behaviour of confined fluids and biological lubrication, and, more recently, tissue engineering. Klein has published over 230 papers, including over 20 in *Science* and *Nature*. His work has been cited some 10,000 times, with an H-factor 53. His honours include the Charles Vernon Boys Prize of the Institute of Physics, UK (1984), the High Polymer Physics Prize of the American Physical Society (1995), the 2010 Prize of the Israel Chemical Society and the 2011 Soft Matter and Biophysical Chemistry Award of the UK Royal Society of Chemistry and the 2012 Tribology Gold Medal. In 2009, he received an ERC Advanced Grant. In 2013 he was elected to the European Academy.

Ali Erdemir



ALI ERDEMIR is a Distinguished Fellow of Argonne National Laboratory and the current President of the Society of Tribologist and Lubrication Engineers (STLE). He received his B.S. degree from Istanbul Technical University in 1977 and M.S. and Ph.D. degrees in Materials Science and Engineering from the Georgia Institute of Technology in 1982 and 1986, respectively. In recognition of his pioneering research, Dr. Erdemir has received numerous coveted awards and honors, including the University of Chicago's Medal of Distinguished Performance, six R&D 100 Awards, Mayo D. Hersey Award of ASME, two AI Sonntag Awards and an Edmond E. Bisson Award from STLE. He is a Fellow of ASME, STLE, AVS, and ASM-International, authored/co-authored more than 300 research articles (240 of which are peer-reviewed) and 18 book/handbook chapters, edited three books, presented more than 160 invited/keynote/plenary talks, and holds 17 U.S. patents. His current research is directed toward nano-scale design and large-scale manufacturing of new materials, coatings, and lubricants for a broad range of applications in transportation, manufacturing, and other energy conversion and utilization systems.

Yonggang Meng



Yonggang Meng is a Professor in mechanical engineering, and serves as the Director of the State Key Laboratory of Tribology (SKLT), Tsinghua University, China. Before he joined the SKLT in 1990, he obtained his Master and Ph.D degrees in mechanical engineering from Kumamoto University, Japan, in 1986 and 1989 respectively. He is the author or co-author of over 160 peer-reviewed papers and 4 book chapters. His research area covers engineering tribology, surface and interface sciences and micro/nanomanufacturing.



Qian Jane Wang



Qian Jane Wang received her Ph. D from Northwestern University, USA, 1993. She taught for five years at Florida International University, USA, and is now a Professor in the Mechanical Engineering Department at Northwestern University, USA. She is also an Adjunct Professor in the School of Mechanical Engineering at Southwest Jiaotong University, China.

She is the receiver of the 2015 Society of Tribologists and Lubrication Engineers (STLE) International Award. She was elected Fellow of the American Society of Mechanical Engineers (ASME) in 2009 and STLE in 2007. She and co-workers won the 2014 and 1997 Captain Alfred E. Hunt Best Paper Award from STLE, the 2015 and 2013 Best Paper Award from ASME Journal of Tribology, the 2013 and 2011 Best Paper Award from STLE Surface Engineering Committee, and the 2010 Edmond E Bisson Best Written Contribution Award from STLE. She also received a CAREER Award 1997 US National Science Foundation. She was one of the two Editors of Encyclopedia of Tribology, published by Springer; she served the professional communities as a Board of Director of STLE during 2008-2009, Chair of the 2011 ASME/STLE International Joint Tribology Conference, Chair of the STLE Annual Meeting Program Committee during 2007-2008, Secretary of the 2005 World Tribology Congress Technical Program Committee, and Member of the Organization Committee of the 2007 International Symposium of Computational Mechanics.

Kenneth Holmberg



Kenneth Holmberg, Dr Tech, is Research Professor in tribology, condition monitoring and operational reliability at the VTT Technical Research Centre of Finland. He is the author and editor of several books and he has given 46 invited keynote lectures at international conferences. He has published more than 200 scientific papers mainly in areas of tribology, surface engineering, lubrication, computational material modelling and simulation, operational reliability, maintenance and diagnostics. He is vice president of the International Tribology Council. He was president of the OECD IRG Wear group 1992-2006 and chairman of the European COST 516&532 TRIBOLOGY joint research actions 1995-2008. He is Chief Engineer Councillor at the Supreme Administrative Court of Finland and a frequently used expert in the European Community and European Science Foundation research actions and programmes. He is in the editorial board of 10 scientific journals and he has been responsible for organising major international conferences in tribology, monitoring and diagnostics e.g. EUROTRIB'89, COMADEM'97 and NORDTRIB'00 & 16. He is member of the Board of Directors at the Taiho Kogyo Tribology Research Foundation (Japan), member of the Steering Committee of the Leonardo Centre of Tribology and Surface Technology at the Sheffield University (UK), member of the Programme Committee for Materials Research at the Foundation of Strategic Research (Sweden), member of the Programme Committee for Strategic Materials Research at FIMECC (Finland), and a frequently used consultant for industrial contracts and R&D projects. At VTT he is presently coordinating the strategic computational materials modelling and simulation research.



Hugh A. Spikes



Hugh Spikes graduated in Natural Sciences from the University of Cambridge in 1968 and obtained his PhD for research in Tribology from Imperial College in 1972. He is currently Emeritus Professor in the Tribology Group at Imperial College London.

Professor Spikes is a Fellow of the Royal Academy of Engineering and also of the Society of Tribologists and Lubrication Engineers. He has been involved in research in tribology for over forty years and has received a number of recognitions for his research achievements including the ASME Mayo D Hersey Award and the STLE International Award. In 2004 he was awarded the Tribology Trust Tribology Gold Medal. Ten of his research publications have received best paper awards, from STLE, IMechE and ASME.

Professor Spikes' research interests span a wide range of liquid lubrication research, including hydrodynamic, elastohydrodynamic and boundary lubrication. A particular research interest has been thin film lubrication and the influence of lubricant molecular composition on the film-forming properties of lubricants and thus on friction and wear performance. Although generally fundamental in nature much of his research has been carried out in collaboration with, and has been funded by, industry and it has made significant contributions to our ability to design low friction lubricants.

Joichi Sugimura



Joichi Sugimura graduated from the University of Tokyo in 1981, and obtained a doctoral degree in 1986. He has been working for Kyushu University since 1986. His research areas are tribology and machine elements. He has also been working for research and education on hydrogen as an energy carrier, and he now directs Research Center for Hydrogen Industrial Use and Storage (HYDROGENIUS). He is also a principal investigator in International Institute for Carbon-Neutral Energy Research (I2CNER) at Kyushu University. His current research interests are tribo-interface in hydrogen and various environments, sealing mechanisms and failures, greases, and modeling of surface microgeometry.



***PROGRAM** OVERVIEW*



PROGRAMME OVERVIEW

SUNDAY, SEPTEMBER 17, 2017			DAY 1 - MONDAY, SEPTEMBER 18, 2017			
LOBBY	9:00-20:00	Registration	LOBBY	8:00-18:00	Registration	
ROOM 201	13:00-18:00	Training Course		Morning		
				9:00-10:00	10:00-10:20	10:20-11:40
			CONVENTION HALL No.1	Opening Ceremony	Break	Plenary Lectures
			Lunch Break			
CONVENTION HALL No.1	19:00-20:30	Welcome Reception	Afternoon			
				13:30-15:30	15:30-15:50	15:50-18:30
CONVENTION HALL No.4 & No.5	9:00-18:00	Exhibits Setup	ROOM 201A	Track1:Science of Tribology Friction Fundamental I	Coffee Break	Track1:Science of Tribology Friction Fundamental II
			ROOM 201B	Track1: Science of Tribology Molecular and Boundary Film Lubrication I		Track1: Science of Tribology Molecular and Boundary Film Lubrication II
			ROOM 201D	Track2:Wear & Surface Engineering Wear I		Track2:Wear & Surface Engineering Wear II
			ROOM 203A	Track2:Wear & Surface Engineering Coatings I		Track2:Wear & Surface Engineering Coatings II
			ROOM 203B	Track2:Wear & Surface Engineering Texturing I		Track2:Wear & Surface Engineering Texturing II
			ROOM 203C	Track3:Lubrication & Lubricants Chemistry of Lubricants I		Track3:Lubrication & Lubricants Rheology of Lubricants I
			ROOM 305A	Track3:Lubrication & Lubricants Additives I		Track3:Lubrication & Lubricants Additives II
			ROOM 305C	Track4:Biortibology & Biomimetics Biomimetics I		Track4:Biortibology & Biomimetics Biomimetics II
			ROOM 303	Track5:Tribology in Manufacturing Machining I		Track5:Tribology in Manufacturing Machining II
			ROOM 305E	Track6:Engine & Transmission Tribology Rolling Bearings I		Track6:Engine & Transmission Tribology Rolling Bearings II
			ROOM 307	Track6:Engine & Transmission Tribology Fluid Film Bearings I		Track6:Engine & Transmission Tribology Fluid Film Bearings II
			ROOM 308	Track7:Industrial Tribo-Systems HDDs & Microsystems I		Track7:Industrial Tribo-Systems HDDs & Microsystems II
ROOM 311A	Track8:Tribotest & Monitoring Tribotest I	Track8:Tribotest & Monitoring Tribotest II				

PROGRAMME OVERVIEW

DAY 2 - TUESDAY, SEPTEMBER 19, 2017

Morning				Afternoon			
LOBBY	8:00-12:00	Registration	12:00-13:30	LOBBY	13:30-18:00	Registration	16:30-18:30
	8:30-9:50				13:30-15:30		
CONVENTION HALL No.1	Plenary Lectures			CONVENTION HALL No.1			
ROOM 201A				ROOM 201A	Track1: Science of Tribology Friction Fundamental IV		Track1: Science of Tribology Friction Fundamental V
ROOM 201B				ROOM 201B	Track1: Science of Tribology Elastohydrodynamic Lubrication II		Track1: Science of Tribology Elastohydrodynamic Lubrication III
ROOM 201D		Coffee Break	Lunch Break	ROOM 201D	Track2: Wear & Surface Engineering Wear IV	Coffee Break & Poster Session (Lounge Area, Level 3)	Track2: Wear & Surface Engineering Wear V
ROOM 203A				ROOM 203A	Track2: Wear & Surface Engineering Coatings IV		Track2: Wear & Surface Engineering Coatings V
ROOM 203B				ROOM 203B	Track2: Wear & Surface Engineering Texturing IV		Track2: Wear & Surface Engineering Texturing V
ROOM 203C				ROOM 203C	Track3: Lubrication & Lubricants Solid Lubricants I		Track3: Lubrication & Lubricants Solid Lubricants II
ROOM 305A				ROOM 305A	Track3: Lubrication & Lubricants Additives IV		Track3: Lubrication & Lubricants Additives V
ROOM 305C		Coffee Break	Lunch Break	ROOM 305C	Track4: Biorhology & Biomimetics Artificial Joints II		Track4: Biorhology & Biomimetics Artificial Joints III
ROOM 303				ROOM 303	Track5: Tribology in Manufacturing Metal Forming & Advanced Processing II		Track5: Tribology in Manufacturing Micro-Nanofabrication
ROOM 305E				ROOM 305E	Track6: Engine & Transmission Tribology Rolling Bearings IV		Track6: Engine & Transmission Tribology Rolling Bearings V
ROOM 307				ROOM 307	Track6: Engine & Transmission Tribology Fluid Film Bearings IV		Track6: Engine & Transmission Tribology Fluid Film Bearings V
ROOM 308				ROOM 308	Track7: Industrial Tribo-Systems Automotive Tribology II		Track7: Industrial Tribo-Systems Space & Aerospace
ROOM 311A		Coffee Break	Lunch Break	ROOM 311A	Track8: Tribotest & Monitoring Condition Monitoring & Data Analysis II		Track8: Tribotest & Monitoring Measurement & Instruments I

PROGRAMME OVERVIEW

DAY 3 - WEDNESDAY, SEPTEMBER 20, 2017

Morning				Afternoon						
LOBBY	8:00-12:00	Registration		LOBBY	13:30-18:00	Registration				
	8:30-9:50	9:50-10:10	10:10-12:00		13:30-15:30	15:30-16:30				
CONVENTION HALL No.1	Plenary Lectures	Coffee Break								
ROOM 201A								Track1: Science of Tribology Tribotechnology I	CONVENTION HALL No.1	Track1: Science of Tribology Tribotechnology II
ROOM 201B								Track1: Science of Tribology Hydrodynamic and Mixed Lubrication	ROOM 201B	Track1: Science of Tribology Elastohydrodynamic Lubrication IV
ROOM 201D								Track2: Wear & Surface Engineering Wear VI	ROOM 201D	Track2: Wear & Surface Engineering Wear VII
ROOM 203A								Track2: Wear & Surface Engineering Coatings VI	ROOM 203A	Track2: Wear & Surface Engineering Coatings VII
ROOM 203B								Track9: Tribology in Future Nanotribology	ROOM 203B	Track9: Tribology in Future Lubrication
ROOM 203C								Track3: Lubrication & Lubricants Liquid Lubricants I	ROOM 203C	Track3: Lubrication & Lubricants Rheology of Lubricants II
ROOM 305A								Track3: Lubrication & Lubricants Additives VI	ROOM 305A	Track3: Lubrication & Lubricants Additives VII
ROOM 305C								Track4: Biotribology & Biomimetics Artificial Joints IV	ROOM 305C	Track4: Biotribology & Biomimetics Artificial Joints V
ROOM 303								Track5: Tribology in Manufacturing CMP & Surface Processing I	ROOM 303	Track5: Tribology in Manufacturing CMP & Surface Processing II
ROOM 305E	Track6: Engine & Transmission Engine I	ROOM 305E	Track6: Engine & Transmission Engine II							
ROOM 307	Track6: Engine & Transmission Fluid Film Bearings VI	ROOM 307	Track6: Engine & Transmission Tribology Sealing I							
ROOM 308	Track7: Industrial Tribo-Systems Green Tribology	ROOM 308	Track7: Industrial Tribo-Systems Railway I							
ROOM 311A	Track8: Tribotest & Monitoring Measurement & Instruments II	ROOM 311A	Track8: Tribotest & Monitoring Measurement & Instruments III							
Coffee Break & Poster Session (Lounge Area, Level 3)										
Track8: Tribotest & Monitoring Measurement & Instruments IV										

PROGRAMME OVERVIEW

DAY 4 - THURSDAY, SEPTEMBER 21, 2017

		Morning			Afternoon	
LOBBY	8:00-12:00	Registration		LOBBY	19:00-21:00	Banquet Dinner
	8:30-9:50				13:30-15:30	15:30-16:50
CONVENTION HALL No.1	Plenary Lectures	9:50-10:10	10:10-12:00	12:00-13:30		15:50-18:30
ROOM 201A		Coffee Break	Track1: Science of Tribology Wear Fundamental I	Lunch Break	CONVENTION HALL No.1	
ROOM 201B			Track1: Science of Tribology Nanotribology I		ROOM 201A	Track1: Science of Tribology Wear Fundamental II
ROOM 201D			Track2: Wear & Surface Engineering Tribo-Materials I		ROOM 201B	Track1: Science of Tribology Nanotribology II
ROOM 203A			Track2: Wear & Surface Engineering Coatings IX		ROOM 201D	Track2: Wear & Surface Engineering Tribo-Materials II
ROOM 203B			Track9: Tribology in Future Wear and Friction Control		ROOM 203A	Track2: Wear & Surface Engineering Coatings X
ROOM 203C		Coffee Break	Track3: Lubrication & Lubricants Liquid Lubricants III		ROOM 203B	Track9: Tribology in Future Carbon Based Materials
ROOM 305A			Track3: Lubrication & Lubricants Ionic Liquids		ROOM 203C	Track3: Lubrication & Lubricants Liquid Lubricants IV
ROOM 305C			Track4: Bioribology & Biomimetics Organs & Tissues II: Skin		ROOM 305A	Track7: Industrial Tribo-Systems Heavy Machinery I
ROOM 303			Track1: Science of Tribology Tribophysics I		ROOM 305C	Track4: Bioribology & Biomimetics Organs & Tissues III
ROOM 305E			Track6: Engine & Transmission Tribology Engine IV		ROOM 303	Track1: Science of Tribology Tribophysics II
ROOM 307		Coffee Break	Track6: Engine & Transmission Tribology Sealing III		ROOM 305E	Track6: Engine & Transmission Tribology Engine V
ROOM 308					ROOM 307	Track6: Engine & Transmission Tribology Sealing IV
ROOM 311A			Track1: Science of Tribology Contact Mechanics I		ROOM 308	Track7: Industrial Tribo-Systems Energy Equipment I
					ROOM 311A	Track1: Science of Tribology Contact Mechanics II
						Coffee Break

PROGRAMME OVERVIEW

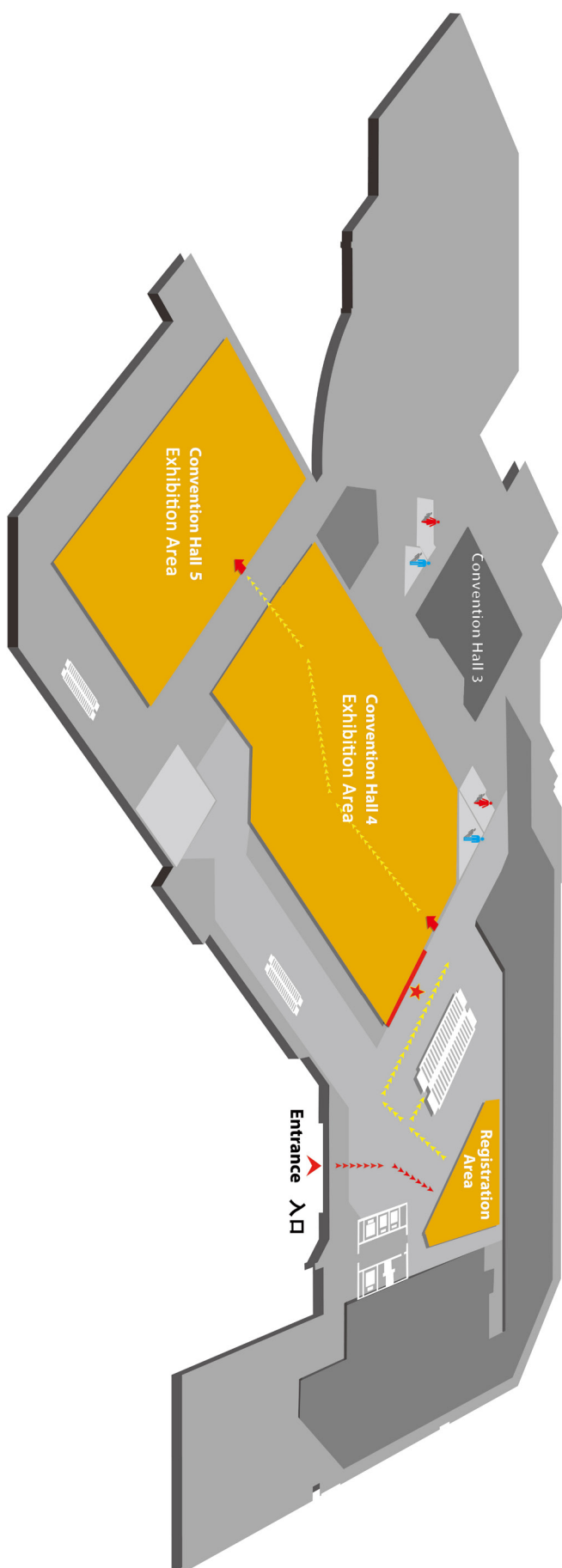
DAY 5 - FRIDAY, SEPTEMBER 22, 2017

Morning						Afternoon		
LOBBY	8:00-10:00	Registration					13:30-15:30	15:30-18:30
	8:30-10:10	10:10-10:30	10:30-12:00	12:00-13:30				
ROOM 201A	Track1: Science of Tribology Superlubricity I	Coffee Break				ROOM 201A	Track1: Science of Tribology Superlubricity III	Coffee Break
ROOM 201B	Track1: Science of Tribology Nanotribology IV					ROOM 201B		
ROOM 201D	Track2: Wear & Surface Engineering Tribo-Materials IV					ROOM 201D	Track2: Wear & Surface Engineering Heat Treatment I	
ROOM 203A	Track2: Wear & Surface Engineering Surface Modification I					ROOM 203A	Track2: Wear & Surface Engineering Surface Modification III	
ROOM 203B	Track2: Wear & Surface Engineering Tribo-Corrosion I					ROOM 203B	Track2: Wear & Surface Engineering Tribo-Corrosion III	
ROOM 203C		Lunch Break				ROOM 203C		
ROOM 305A						ROOM 305A		
ROOM 305C	Track4: Biotribology & Biomimetics Biosurface & Contact I					ROOM 305C	Track4: Biotribology & Biomimetics Biomaterials I	
ROOM 305E	Track6: Engine & Transmission Tribology Gears I					ROOM 305E	Track6: Engine & Transmission Tribology Gears III	
ROOM 307	Track6: Engine & Transmission Tribology Materials II					ROOM 307		
ROOM 308	Track7: Industrial Tribo-Systems Tribology of Machine Elements I	Coffee Break				ROOM 308		
ROOM 311A	Track1: Science of Tribology Contact Mechanics IV					ROOM 311A		

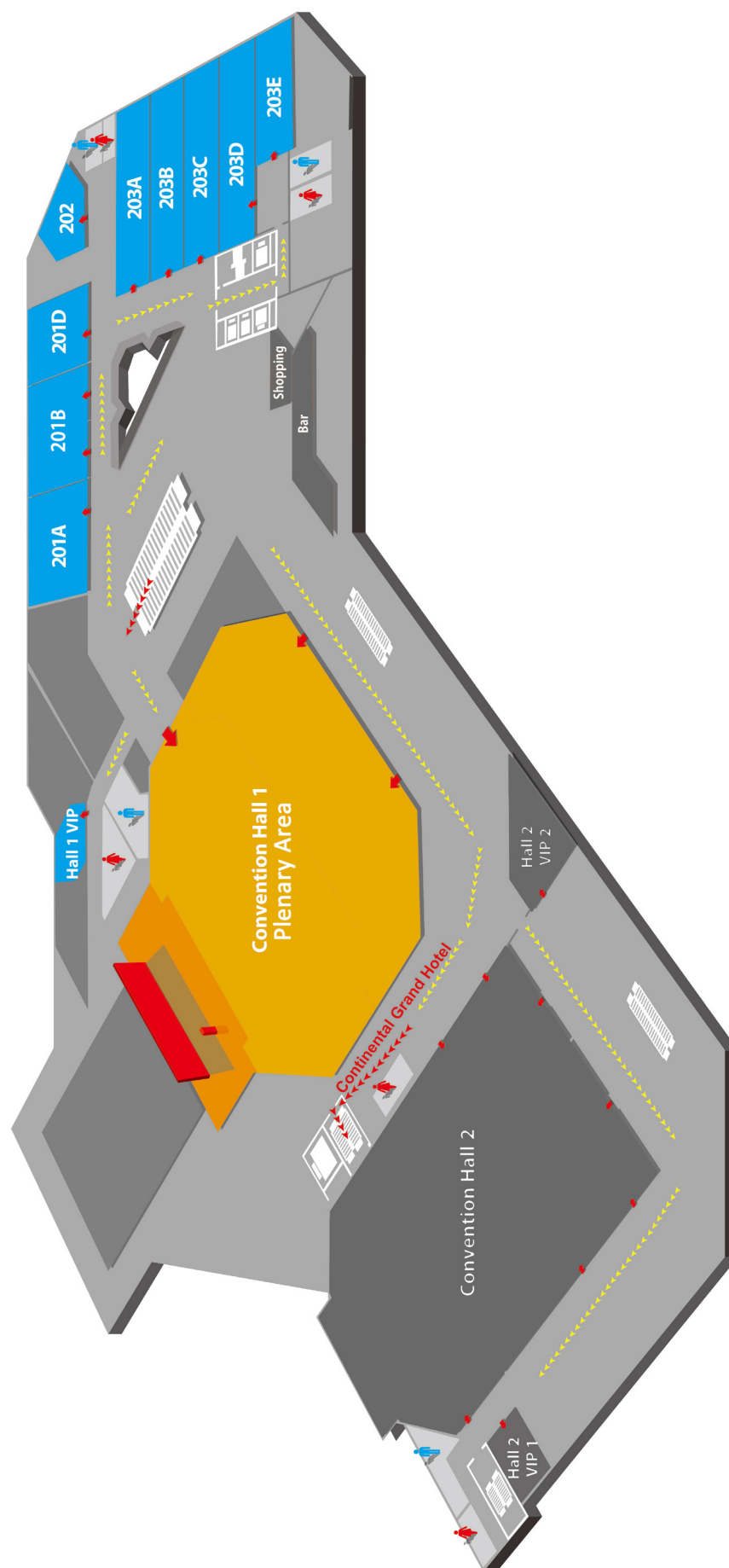
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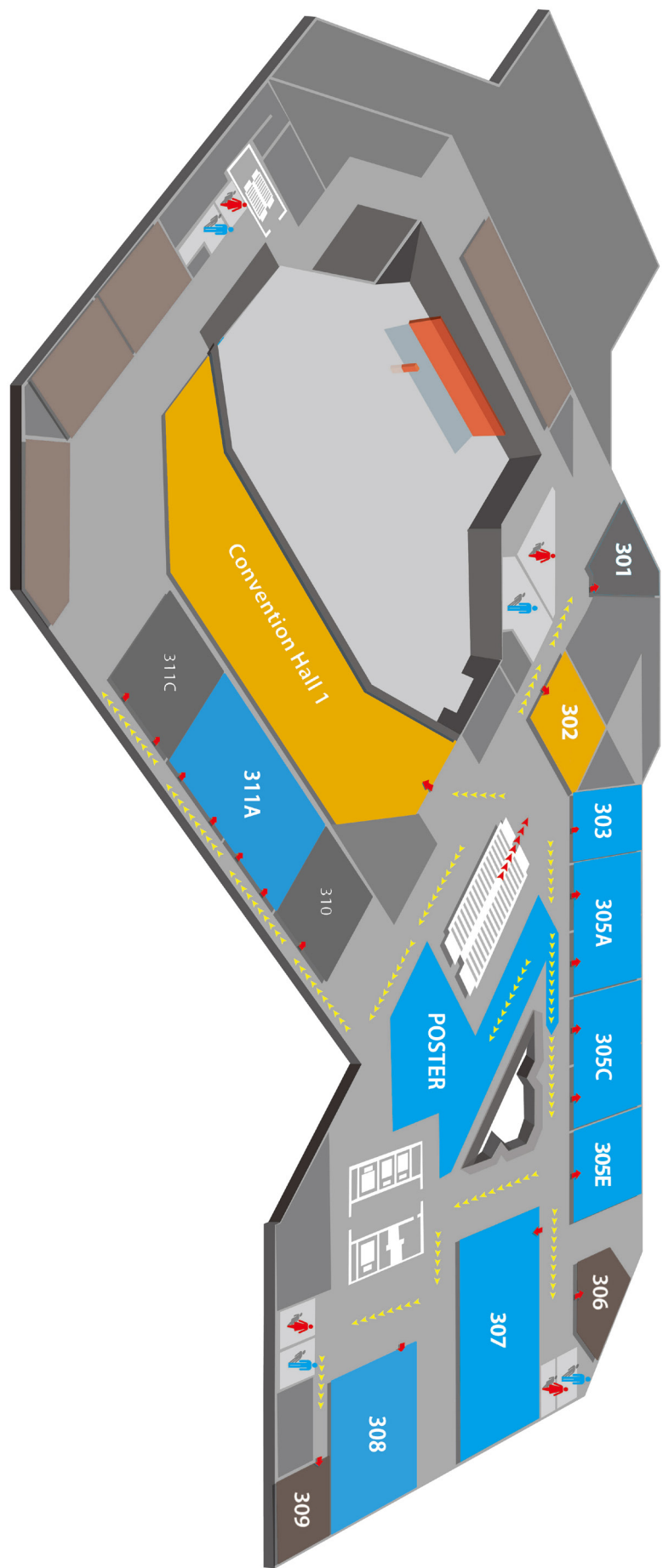
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TRAINING ***& WORKSHOPS***





2017 World Tribology Congress •Plenary Training Lecture

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6 Top Experts share with you the frontier trends of tribology. Content covers the frontier and foundation of friction and lubrication, physical chemistry, lubricating material, etc. In here, you can feel the wisdom of academicians, listen to the voices of international experts and touch the pinnacle of friction and lubrication field.

Experts

Xue Qunji, Member of the Chinese Academy of Engineering. Prof. Xue's research includes special lubricating materials and material chemistry, he is one of the major academic leaders in this field.

Awards Won :

Supreme Achievement Award in Tribology in 2009;

Tribology Gold Medal in 2011, which is the top prize in the international field of tribology.

Wilfried J. Bartz, Key Scientist at AC²T Research GmbH, Consultant for Tribology at Technical Academy Esslingen. He is engaged in non-Newtonian lubricants in journal bearings, gear lubrication, engine lubrication and solid and synthetic lubricants.

Awards Won :

German Distinguished Service Cross; Tribology Gold Medal, The Tribology Trust Fund; Austrian I. Class Cross of Honour for Science and Arts; International Tribology Award of STLE; Honorary Doctor of Science, V.A. Belyi Metal-Polymer Research Institute, Gomel

Ali Erdemir, Member of the Argonne National Laboratory

He is an Argonne Distinguished Fellow and Senior Scientist with international recognition and significant accomplishments in the fields of materials science, surface engineering and tribology.

He has received numerous awards, including 6 R&D 100 Awards; he holds 15 U.S. patents; and has published more than 300 papers, 18 invited book and handbook chapters, and 3 edited books.

Raymund Polcarpio, Regional BD Manager - APAC, SGS

SGS is the world's leading inspection, verification, testing and certification company, which is recognized as the global benchmark for quality and integrity.

Michael Anderson

International Sales Manager, Falex Corp. Certified Lubrication Specialist of STLE

Greg Croce

Technical Manager, Chevron Lubricants. Certified Lubrication Specialist of STLE

They are frequent contributors to technical education courses. Greg currently serves as the chairman of STLE's Education Committee. Both of them have earned the STLE Certified Lubrication Specialist designation, the only independent certification for the lubrication professional that verifies your broad lubrication engineering knowledge.

Agenda

TIME (09/17, 2017)

Lecturers & Topics

09:00-13:00

Registration

13:00-13:05

Opening Remarks

13:05-13:50

Xue Qunji, Tribochemistry

13:50-14:35

Wilfried J. Bartz, From Combustion Engines to Electromobility – Tribological Aspects

14:35-15:20

Ali Erdemir, Friction Control Technology: A Pathway to Energy Savings and Environmental Sustainability

15:20-15:30

Break

15:30-16:15

Raymund Polcarpio, Oil Analysis Fundamentals

16:15-17:00

Michael Anderson, Tribology: The Science and How to Measure It

17:00-17:45

Greg Croce, Additive Chemistry: Fundamental Concepts and Advanced Formulation Issues

Registration Fee :1) The participants have registered WTC 2017, free of charge

2) The participants have not registered WTC 2017, 800RMB per person

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WTC- 2017

C&U Group WORKSHOP Agenda

Conference theme: Bearing & tribology

Guest speakers: Mr. Jiaqun He, Mr. Lianchun Zhao Mr. Changjian Guo

Conference time: 13:30-16:00, 19th September 2017

Conference location: Beijing China National Convention Center, Conference Room No.302

Conference duration: 2.5 hours

Conferee: University scholars invited by C&U, WTC conferee



Mr. Jiaqun He
National science award
evaluation expert
Professor level senior engineer
Special member of China
bearing industry association



Mr. Lianchun Zhao
Ph,D in Engineering Tribology
of Zhejiang University,
Professorate Senior Engineer,
Vice General Secretary of
SAT/TC98



Mr. Changjian Guo
Director C&U Group R&D
Center, Member of Technical
Committee of CBIA, Member of
Expert Committee of CBIA

Conference agenda details:

Process		Content	Responsible person	Time
1	Opening	Conference theme, process Guests, C&U introduction Express welcome and guide into speech	Mr. Ning Zhang (Host)	10mins
			Miss Fang Lu (Interpreter)	
2	Speech 1	Low friction design applied in bearing	Mr. Changjian Guo	30mins
3	Speech 2	Development status and trend of China and world bearing industry	Mr. Jiaqun He (Presenter)	30mins
			Miss Fang Lu (Interpreter)	
4	Break time	Break and communication time	Mr. Ning Zhang (Host)	10mins
			Conference service staffs	
5	Speech 3	Tribology failure and lubrication of rolling bearings	Mr. Lianchun Zhao	30mins
6	Q & A	Q & A about the speech of three guest speakers and related questions about theme of this workshop	Mr. Ning Zhang (Host)	30mins
			Miss Fang Lu (Interpreter)	
			Conference service staffs	
7	Summary	Summarize the topic of conference Express gratitude to conferee	Mr. Ning Zhang (Host)	5mins
			Miss Fang Lu (Interpreter)	

LUBRICATION and TRIBOLOGY WORKSHOP

Hosted by Sinopec Lubricant Co., Ltd.

Time: 16:15-18:15, 19th September 2017

Venue: Room 302



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Moderator

Dr. SHUI Lin

Vice Director of Technology Management Department,
Sinopec Lubricant Co., Ltd., China

Speakers



Mr. WU Baojie

Director of Tianjin Branch of
Sinopec Lubricant Co.,
Ltd., China



Dr. DU Xueling,

Deputy Director of Beijing
Research Institute, Sinopec
Lubricant Co., Ltd., China

Agenda

Dr. SHUI Lin	Welcome Company Introduction	16:15-16:30
Mr. WU Baojie	The Tribological Performance of Grease Thickeners Crystal	16:30-17:10
	Discussion	17:10-17:20
Dr. DU Xueling	Tribological Performance Study of Different Transmission Fluids in Manual Transmission	17:20-18:00
	Discussion	18:00-18:15
END		

***TECHNICAL** SESSIONS*



Room 201A**Track1: Science of Tribology****Friction Fundamental I****Chair: Michael URBACH**, *Tel Aviv University, Israel***13:30-14:00 Keynote**

Scale dependence of friction and contact from nanometer to millimeter tip radii

Mark ROBBINS

*The Johns Hopkins University, USA***14:00-14:25 Invited**

Amontons' law between randomly rough surfaces

Hiroshi MATSUKAWA

*Aoyama Gakuin University, Japan***14:25-14:45**

Sliding friction of graphene/h-BN heterojunctions: towards robust solid nano-lubrication

Davide MANDELLI, Itai LEVEN, Oded HOD, Michael URBACH

*Tel Aviv University, Israel***14:45-15:05**Friction coefficient measured on a single WS₂ nanoparticle: an in situ transmission electron microscope experiment

Fabrice DASSENNOY, Istvan JENEI

*Ecole Centrale de Lyon, France***15:05-15:25**

From the multi-contact to rate-state model

Wengen OUYANG¹, Ming MA², Michael URBACH¹¹*Tel Aviv University, Israel*; ²*Tsinghua University, China***15:30-15:50**

Coffee Break

Room 201A**Track1: Science of Tribology****Friction Fundamental II****Chair: Hiroshi MATSUKAWA**, *Aoyama Gakuin University, Japan***15:50-16:10**

Tribochemical wear of bare silicon in humid air and alkali solutions

Cheng CHEN, Peng ZHANG, Chen XIAO, Lei CHEN, Linmao QIAN

*Southwest Jiaotong University, China***16:10-16:30**

Low-friction characterization of random-textured surface of microcrystalline diamond coatings, thanks to the relaxation tribometer technique

Michel BELIN¹, Hiroyuki MIKI², Toshiyuki TAKAGI²¹*CNRS, France*; ²*Tohoku University, Japan***16:30-16:50**

Numerical prediction of the optimal surface roughness of boundary friction

Xiaogang ZHANG¹, Yali ZHANG², Tonghai WU³, SangarapillaiKANAPATHIPILLAI¹, Zhongxiao PENG¹¹*The University of New South Wales, Australia*; ²*Southwest Jiaotong University, China*; ³*Xi'an Jiaotong University, China***16:50-17:10**

Superlubricity of graphene at the microscale

Tianbao MA

*Tsinghua University, China***17:10-17:30**

A numerical approach to predict tribological behaviour in soft contacts

Qian WANG¹, Tom REDDYHOFF¹, Nicolaas-Alexander GOTZEN², Wim BUSEYNE², Daniele DINI¹¹*Imperial College London, UK*; ²*Robert Bosch Produktie N.V., Belgium***17:30-17:50**

Numerical analysis of surface forces of diamond-like-carbon surface covered with molecularly thin lubricant film

Kyosuke ONO

*Tokyo Institute of Technology, Japan***17:50-18:10**

Numerical simulation on the adhesive contact between rough surfaces

Jiunn-Jong WU

*Chang Gung University, Taiwan, China***18:10-18:30**

Threshold energy for tribochemical removal of silicon surface

Chen XIAO, Lei CHEN, Cheng CHEN, Peng ZHANG, Linmao QIAN

*Southwest Jiaotong University, China***Room 201B****Track1: Science of Tribology****Molecular and Boundary Film Lubrication I****Chair: Yu TIAN**, *Tsinghua University, China***13:30-13:55 Invited**

The relationship between wetting and lubrication

Feng ZHOU

*Lanzhou Institute of Chemical Physics, China***13:55-14:15**

Boundary film formation and competitive adsorption

Sophie CAMPEN, Janet WONG

*Imperial College London, UK***14:15-14:35**

Asperity scale description of initial stages of a boundary lubricated contact

Peter JACOBS¹, Andrew KONICEK¹, Fang CAO¹, Gary HUNTER¹, Martin WEBSTER¹, Simon MEDINA¹, Daniele DINI^{2,3}¹*ExxonMobil Corporate Strategic Research, USA*; ²*Imperial Consultants, UK*;³*Imperial College, UK***14:35-14:55**

Liquid/solid interface of ionic liquids: an investigation of molecular behavior

Haoyu LI, Liran MA, Jianbin LUO

*Tsinghua University, China***14:55-15:15**

Effect of lubricant volume on thin film hydrodynamic lubrication

Liang GUO¹, Patrick WONG¹, Feng GUO²¹*City University of Hong Kong, Hong Kong, China*; ²*Qingdao University of Technology, China*

15:15-15:50
Coffee Break

Room 201B

Track1: Science of Tribology

Molecular and Boundary Film Lubrication II

Chair: Feng ZHOU, Lanzhou Institute of Chemical Physics, China

15:50-16:15 Invited

Excellent lubrication of liquid metal under extremely high load

Yu TIAN

Tsinghua University, China

16:15-16:40 Invited

In-situ tracking of the dynamic structure evolution in nanometer confined liquids by combining X-Ray reflectivity and white light interferometry in a surface forces apparatus

Markus VALTINER^{1,3}, Sadhanaa BUVANESWARAN¹, Henning WEISS², Hsiu-Wei CHENG¹, Claudia MEROLA¹, Julian MARS², Markus MEZGER²

¹Max-Planck-Institut f. Eisenforschung GmbH, Germany; ²Max-Planck-Institut f. Polymerforschung, Germany; ³Technische Universität Bergakademie Freiberg, Germany

16:40-17:00

Forced oscillations and real-time insights of lubricated interfaces

Malik YAHIAOUI, Emmanuel RIGAUD, Denis MAZUYER, Juliette CAYER-BARRIOZ

Ecole Centrale de Lyon, France

17:00-17:20

Probing the soft spot: fluid confinement in contact

Rok SIMIC, Christian H MATHIS, Nicholas D SPENCER

ETH Zurich, Switzerland

17:20-17:40

A deterministic model for boundary lubrication and flash temperature in a transient elliptical contact

Dichu XU¹, Jiugen WANG¹, Anne NEVILLE², Ardian MORINA²

¹Zhejiang University, China; ²University of Leeds, UK

17:40-18:00

Experimental investigation on the friction modifier effect of vegetable oil derived biodiesels

Siti Hartini HAMDAN^{1,3}, William Woei Fong CHONG²

¹University of Southampton Malaysia Campus, Malaysia; ²Universiti Teknologi Malaysia, Malaysia; ³University Kuala Lumpur, Malaysia

Room 201D

Track 2: Wear & Surface Engineering

Wear I

Chair: Noritsugu UMEHARA, Nagoya University, Japan

13:30-14:00 Keynote

Erosion by solid, liquid droplet and micro-jet (due to bubble collapse) impact: the importance of stress waves

Robert JK WOOD

University of Southampton, United Kingdom

14:00-14:25 Invited

Erosive, abrasive and sliding wear characteristics of super-hard, ultra-thick nanocomposite coatings

Ronghua WEI

Southwest Research Institute, United States

14:25-14:45

Friction and wear behaviour in dry sliding of hard metals

Andreas BLUTMAGER¹, Markus VARGA², Paul Heinz MAYRHOFER³, Walter FRIESENBICHLER¹

¹Montanuniversität Leoben, Austria; ²AC2T research GmbH, Austria; ³TU Wien, Austria

14:45-15:05

Transition of heat generation behavior during scuffing process of steel

Yasuo MATSUZAKI, Kazuyuki YAGI, Joichi SUGIMURA

Kyushu University, Japan

15:05-15:25

Influence of ceramic tribo-elements on friction and wear of smooth steel surfaces

Andrzej DZIERWA¹, Pawel PAWLUS¹, Rafal REIZER²

¹Rzeszow University of Technology, Poland; ²University of Rzeszow, Poland

15:25-15:50

Coffee Break

Room 201D

Track 2: Wear & Surface Engineering

Wear II

Chair: Jianhua ZHANG, Shanghai University, China

15:50-16:15 Invited

White etching cracks (WECs) in wind turbine bearings

Ling WANG¹, Walter HOLWEGGER²

¹nCATS, Faculty of Engineering and the Environment, University of Southampton, UK; ²Schaeffler Technologies AG & Co. KG, Germany

16:15-16:35

Tribological investigations of particle of phase change reinforced nylon under high load and speed

Bingli PAN

Henan University of Science and Technology, China

16:35-16:55

Influence of different abrasive wear methods on the surface of nanoausferritic ductile iron castings

Dawid MYSZKA¹, Andrzej N. WIECZOREK²

¹Warsaw University of Technology, Poland; ²Silesian University of Technology, Poland

16:55-17:15

Tribological behavior of nitrided ductile cast iron D6510 under different contacting conditions

Xueyuan NIE, Chen ZHAO, Ran CAI, Jingzeng ZHANG

University of Windsor, Canada

17:15-17:35

Wear behavior of tetrahedral amorphous carbon nitride sliding against steel and alumina disks under PAO oil lubrication

Xiaoxu LIU, Ryo YAMAGUCHI, Noritsugu UMEHARA, Motoyuki MURASHIMA

Nagoya University, Japan



17:35-17:55

Effect of applied load on wear property of tetrahedral amorphous carbon and hydrogenated amorphous carbon under the oil boundary

Li XIANG¹, Noritsugu UMEHARA¹, Hiroyuki KOUSAKA²¹Nagoya University, Japan; ²Gifu University, Japan**17:55-18:15**

Tribological behavior of electron beam melting printed Ti-6Al-4V samples

Weiquan TOH¹, Xipeng TAN¹, Erjia LIU², Shu Beng TOR²¹Singapore Center for 3D Printing, Singapore; ²Nanyang Technological University, Singapore**18:15-18:35**

A new methodology to evaluate the abrasion property of polymer surface

Shuai LIU, Vincent LE HOUEROU, Christian GAUTHIER

Institut Charles Sadron, France

Room 203A**Track 2: Wear & Surface Engineering
Coatings I****Chair: Haidou WANG, Academy of Armored Forces Engineering, China****13:30-14:00 Keynote**

Continuous formation of nanointerface to promote super-low friction of carbon-based coatings

Koshi ADACHI

Tohoku University, Japan

14:00-14:20Ultralow friction of ZrO₂ ball sliding against DLC films under different testing environments and temperaturesQunfeng ZENG^{1,2}, Ali ERDEMIR², Osman ERYLIMAZ², Giovanni RAMIREZ²¹Xi'an Jiaotong University, China; ²Argonne National Laboratory, United States**14:20-14:40**

Carbonaceous tribo-layer for the super-low friction of carbon nitride coatings

Naohiro YAMADA, Takanori TAKENO, Koshi ADACHI

Tohoku University, Japan

14:40-15:00

Low friction Induced by 1 nm alternative layer in nanocrystalline multilayer carbon films

Peidong XUE¹, Lei YANG¹, Dongfeng DIAO²¹Xi'an Jiaotong University, China; ²Guangdong Provincial Key Laboratory of Micro/Nano Optomechatronics Engineering, China**15:00-15:20**

Effect of tribofilm's morphology on the tribological properties of DLC: ZnDTP derived tribofilm characterization by 3D SEM observation

Kouami Auxence Melardot ABOUA

Nagoya University, Japan

15:30-15:50

Coffee Break

Room 203A**Track 2: Wear & Surface Engineering
Coatings II****Chair: Dae-Eun KIM, Yonsei University, Korea****15:50-16:15 Invited**

Surface chemistry and Structural Changes of Compliant Hard Carbon Coatings for achieving superlubricity

Maria Isabel DE BARROS BOUCHET, Jean-Michel MARTIN

Laboratoire de Tribologie et Dynamique des Systèmes, Université de Lyon, France

16:15-16:35

Atmospheric helium plasma irradiation to Si containing DLC surface during sliding against plastic balls

Hiroyuki KOUSAKA^{1,2}, Shunsuke OKUMURA², Noritsugu UMEHARA²,Motoyuki OKUMURA²¹Gifu University, Japan; ²Nagoya University, Japan**16:35-16:55**

Tribology of different types of very hard carbon

Volker WEHNACHT, Stefan MAKOWSKI, Frank SCHALLER, Andreas LESON

Fraunhofer IWS, Germany

16:55-17:15

Tribological study of thick ta-C coating at elevated temperatures prepared under different substrate bias voltages

Woo Young LEE¹, Noritsugu UMEHARA¹, Takayuki TOKOROYAMA¹, MotoyukiMURASHIMA¹, Young Jun JANG², Jong Kuk KIM²¹Nagoya University, Japan; ²Korea Institute of Materials Science, Korea**17:15-17:35**

High-temperature friction coefficients and wear of an amorphous hydrogenated DLC coating

Youfeng ZHANG, Andreas POLYCARPOU

Texas A & M University, United States

17:35-17:55

The effect of penetrated diamond-like carbon overcoat on the fretting wear performance

Zhengqiang TANG, Dongdong ZHOU, Huijie ZHANG

Guizhou University, China

17:55-18:15

Molecular dynamics study on nanoindentation of ultra-thin amorphous carbon films on silicon substrate

Qingkang LIU, Longqiu LI, Guangyu ZHANG, Guangbin SHAO

Harbin Institute of Technology, China

18:15-18:35

Effect of lubricant formulations on the tribological performance of diamond-like carbon (DLC) coated direct-acting valve train components

Rehan ZAHID^{1,2}, Masjuki HASSAN¹, Abul KALAM¹, Mahendra VARMA¹, RiazMUFTI², Nurin ZULKIFLI¹, Mubashir GULZAR¹, Usman ABDULLAH², UsmanBHUTTA², Mian ASHFAP²¹University of Malaya, Malaysia; ²NUST School, China

Room 203B

Track 2: Wear & Surface Engineering

Texturing I

Chair: Izhak ETSION, *Technion-Israel Institute of Technology, Israel*

13:30-13:50

The tribological performance of roller and ball bearings by direct laser interference patterningChia-Jui HSU¹, Carsten GACHOT², Andreas STRATMANN³¹Saarland University, Germany; ²Vienna University of Technology, Austria;³RWTH Aachen University, Germany

13:50-14:10

The combined effects of surface textures and friction modifier MoDDP under flooded and starved lubrication conditionsLinqing BAI¹, Yonggang MENG¹, Varian ZHANG²¹State Key Laboratory of Tribology, China; ²Shell (Shanghai) Technology Ltd., China

14:10-14:30

Tribological properties of carbon film with pit-type array fabricated by plasma etching through pre-substrate filterSicheng CHEN¹, Lei YANG¹, Dongfeng DIAO²¹Xi'an Jiaotong University, China; ²Shenzhen University, China

14:30-14:50

Formation of nanoholes and nanobumps by multiple laser pulses irradiation of silica spheres

Dong FENG, Jiadao WANG, Songling XING

Tsinghua University, China

14:50-15:10

Piston surface textures to improve the lubrication performance of swash plate pumpXuan MA^{1,2}, Xiqun LU¹, Viral S. MEHTA³, Qian Jane WANG²¹Harbin Engineering University, China; ²Northwestern University, USA;³Caterpillar, USA

15:10-15:30

Patterning on different scales to guide lubricants effectivelyPhilipp GRÜTZMACHER¹, Andreas ROSENKRANZ², Carsten GACHOT³, Frank MÜCKLICH¹¹Saarland University, Germany; ²University of California, USA; ³Vienna University of Technology, Austria

15:30-15:50

Coffee Break

Room 203B

Track 2: Wear & Surface Engineering

Texturing II

Chair: Jiliang MO, *Southwest Jiaotong University, China*15:50-16:15 **Invited****A critical review about past, present and future developments in surface texturing for tribological applications**

Gachot CARSTEN

Vienna University of Technology, Austria

16:15-16:35

Design, manufacturing and tribological performance of microtextured bucket tappets for friction reduction in the valve trainMax MARIAN¹, Michael ZAHNER², Stephan TREMMEL¹, Kolja ANDREAS², Marion MERKLEIN², Sandro WARTZACK¹¹Engineering Design, FAU Erlangen-Nuremberg, Germany; ²Manufacturing Technology, FAU Erlangen-Nuremberg, Germany

16:35-16:55

Effect of microdimple textured surface on friction under elastic dry reciprocating contacts

Muthu Kumar MARIAPPAN, M. S. BOBJI

Indian Institute Of Science, India

17:10-17:30

Thermohydrodynamic lubrication analysis of a surface textured parallel thrust bearings

Tae-Jo PARK, Min-Gyu KIM

Gyeongsang National University, Korea

17:30-17:50

Effect of surface texturing and air-plasma treatment on the adhesive strength of high build epoxy coatings on metallic substrates

Bobby SATHEESAN, Abdul Samad MOHAMMED

King Fahd University of Petroleum and Minerals, Saudi Arabia

17:50-18:10

Influence of internal wall ripple structure on cavitation flow characteristics of organ pipe nozzle

Xiang XU, Jun SUN, Xinze ZHAO, Hongling QIN, Meiyun ZHAO

China Three Gorges University, China

18:10-18:30

Effect of aloe glue on the tribological properties of multi-level textured Mg alloy surface

Dongya ZHANG, Yanfeng GE, Jianlei WANG

Xi'an University of Technology, China

Room 203C

Track3: Lubrication and Lubricants

Chemistry of lubricants I

Chair: W Gregory SAWYER, *University of Florida, USA*13:30-14:00 **Keynote****Moving tribochemistry into the third dimension**

Nicholas D. SPENCER

*ETH Zurich, Switzerland*14:00-14:25 **Invited****Reaction pathway and kinetic modeling of the gas-phase lubrication of copper by dialkyl disulfides**Wilfred TYSOE¹, Heather ADAMS¹, Ashlie MARTINI²¹University of Wisconsin-Milwaukee, USA; ²University of California-Merced, USA

14:25-14:45

Effects of temperature on friction and wear properties of poly-alpha-olefin in reciprocating sliding tests

Lichun HAO, He YANG, Ying XUE

RIPP, China

14:45-15:05

Relationships between molecular structure and properties of polyalphaolefin (pao): spectral, thermal and oxidation stabilities

Jiusheng LI, Yuefeng MA, Jian XU

Shanghai Advanced Research Institute, Chinese Academy of Sciences, China

15:05-15:25

Adsorption and thin film lubrication of aqueous tri-block copolymer lubricant on 3D rough TiO₂ surfaces

Thi Dinh TA, Anh Kiet TIEU, Hongtao ZHU, Ha Manh LE, Huong Thi Thuy TA

University of Wollongong, Australia

15:25-15:50

Coffee Break

Room 203C

Track3: Lubrication and Lubricants

Rheology of lubricants II

Chair: W Gregory SAWYER, University of Florida, USA

15:50-16:15 Invited

Lubricant rheology and lubrication of rough surfaces

Petr SPERKA, Ivan KRUPKA, Martin HARTL

Brno University of Technology, Czech

16:15-16:35

The application of a molecular-continuum coupling strategy for the modelling of liquid lubricants

Fernandez Eduardo RAMOS, Edward SMITH, Daniele DINI

Imperial College London, UK

16:35-16:55

Elastohydrodynamic lubrication and the glass transition: linking experiment and simulation at high rates and pressures

Mark ROBBINS¹, Vikram JADHAO^{1,2}

¹Johns Hopkins University, UK; ²Indiana University, USA

16:55-17:15

A new rheology model based on the time of recovery and simulations of the rheological behavior for oils with various viscosity

Ping YANG, Jinlei CUI, Xiaoling LIU, Peiran YANG

Qingdao university of technology, China

17:15-17:35

Study on the development of oil film state in a rotating disk

Dingming WANG, Bo CHEN, Zhongtao GU

Southwest University of Science and Technology, China

17:35-17:55

Inhomogeneous film formation of solidified lubricant in elastohydrodynamic lubrication conditions

Kazuyuki YAGI, Kazuki NISHIDA, Joichi SUGIMURA

Kyushu University, Japan

17:55-18:15

New mensuration of high pressure density upto 1.2 GPa for Lubricants

Bo ZHANG, Yohei SAKAMOTO, Toshifumi MAWATARI

Saga University, Japan

Room 305A

Track3: Lubrication and Lubricants

Additives I

Chair: Janet WONG, Imperial College London, UK

13:30-13:55 Invited

Tribological behavior of industrial WS₂ nanoparticles in PAO base oil on smooth and rough surfaces

Fabrice DASSENNOY¹, Paula USSA^{1,2}, Thierry LE MOGNE¹, Béatrice VACHER¹, Benoit THIEBAUT²

¹Ecole Centrale de Lyon, France; ²TOTAL, France

13:55-14:15

Influences of sulfur-containing additives on grease decomposition by nascent metal surface

Peng YAO¹, Tomoya UETA¹, Kyoji KONDO¹, Toshiaki WAKABAYASHI¹, Yasuha TOKUMO², Yusuke AYAME², Yuji SHITARA²

¹Kagawa University, Japan; ²JX Nippon Oil & Energy Corporation, Japan

14:15-14:35

The study of quantitative structure tribo-ability relationship for organic compounds as lubricant additives

Xinlei GAO¹, Kang DAI², Zhan WANG¹, Tingting WANG¹

¹Wuhan Polytechnic University, China; ²South-Central University for Nationalities, China

14:35-14:55

The importance of spectrum or actual loading in milled MoS₂ powder greases using four ball wear test

Gabi NEHME

University of Balamand, Lebanon

14:55-15:15

Effect of fatty acid additives on viscoelastic properties of poly-alfa-olefin lubricants confined and sheared in nanometer-sized gap

Shintaro ITOH, Kento KAMIYA, Kenji FUKUZAWA, Hedong ZHANG

Nagoya University, Japan

15:15-15:35

The size effect on the tribological properties of few-layer graphene oxide sheets as water-based lubricant additives

Zhe CHEN, Yuhong LIU, Jianbin LUO

Tsinghua University, China

15:35-15:50

Coffee Break

Room 305A

Track3: Lubrication and Lubricants

Additives II

Chair: C.H. VENNER, University of Twente, Netherland

15:50-16:10

Adsorption behaviour and nanotribological property of sodium carboxylate on Fe substrate in water

Naoki AKAMATSU, Tomoko HIRAYAMA, Takashi MATSUOKA, Hideaki HATTORI, Fumiaki TAKAGI, Norifumi YAMADA

Doshisha University, JST Presto, Idemitsu Kosan Co. Ltd., KEK, Japan



16:10-16:30**Microencapsulation of additives**

Stephen HSU, Fei ZHAO, Sulaksha PARAB

*George Washington University, United States***16:30-16:50**Interactions of IF-MeS₂ (Me=Metal) nanoparticle additives with lubricant co-additivesFabrice DASSENIOY¹, Paula USSA¹, Pierre RABASO³, Fabrice VILLE³, Michel BELIN¹, Thierry LE MOGNE¹, Béatrice VACHER¹, Jérôme CAVORET³, Moussa DIABY⁴, Benoit THIEBAUT²¹Ecole Centrale de Lyon, France; ²TOTAL, France; ³INSA de Lyon, France; ⁴PSA, France**16:50-17:10****Effect of addition of ceramic-based particles with friction modifier additive in base oil on tribological behaviour of steel – steel contacts**

Pushkar DESHPANDE, Clotilde MINFRAY, Fabrice DASSENIOY, Benoit THIEBAUT, Frederic JARNIAS, Thierry LE MOGNE, Beatrice VACHER

*Laboratoire de Tribologie et Dynamique des Systèmes, France***17:10-17:30****Ideal organic friction modifier solutions**

Ben FRY, Sophie CAMPEN, Hugh SPIKES, Janet WONG

*Imperial College London, United Kingdom***17:30-17:50****Effect of additives on load capacity improvement of DLC coated sliding surface**Kimio IMAI¹, Fumihito ITOIGAWA¹, Atsushi AKAMATSU², Akira WATANABE², Takashi NAKAMURA¹¹Nagoya Institute of Technology, Japan; ²Cosmo Oil Lubricants CO.,LTD., Japan**17:50-18:10****The preparation of nano-PVDF and its tribological properties as lubricant additives**

Xing LI, Hailin LU, Guangneng DONG

*Key Laboratory of Modern Design and Rotor-Bearing System of Education Ministry, Xi'an Jiaotong University, China***18:10-18:30****Preparation and tribological properties of water-soluble copper/silica nanocomposite as a water-based lubricant additive**

Tiantian LIU

*National & Local Joint Engineering Research Center for Applied Technology of Hybrid Nanomaterials, China***Room 305C****Track4: Biotribology & Biomimetics****Biomimetics I****Chair: Zhiwu HAN**, Key Laboratory of Bionic Engineering, Ministry of Education, Jilin University, China**13:30-13:55 Invited****Biomimetics on gecko locomotion: mechanism, dynamics and gecko-inspired robots**

Zhendong DAI, Yi SONG, Zhouyi WANG

*Nanjing University of Aeronautics and Astronautics, China***13:55-14:15****An experimental based analytical model for the effect of counter-face roughness on the friction of gecko-like biomimetic microstructure**Haytam KASEM¹, Yossi COHEN²¹Azrieli College of Engineering, Jerusalem Israel; ²Tribology Labs. Israel Institute of Metals, Israel**14:15-14:35****Robust self-cleaning and micromanipulation capabilities of gecko spatulae and their bio-mimics**Quan XU¹, Yiyang WAN³, Dashuai TAO², Yu TIAN², Zhenhai XIA³¹China University of Petroleum (Beijing), China; ²Tsinghua University, China;³University of North Texas, USA**14:35-14:55****Fish drag-reducing mechanism based on the bioelectricity effect**Na SUN¹, Shiqing SUN¹, Bao WANG², Dangguo LI², Darong CHEN², Lina SI¹, Xiaoli WANG¹¹Beijing Institute of Technology, China; ²Tsinghua University, China**14:55-15:15****Investigation of drag reduction performance of micro-trapezoidal groove surfaces**

Xiuqin BAI, Linshan ZHAO, Yifeng FU, Chengqing YUAN, Xinping YAN

*Wuhan University of Technology, China***15:15-15:35****Development of clean biomimetic dry adhesive**Peter BREITMAN¹, Yuri KLIGERMAN¹, Michael VARENBURG²¹Technion - Israel Institute of Technology, Israel; ²Georgia Institute of Technology, America**15:35-15:50****Coffee Break****Room 305C****Track4: Biotribology & Biomimetics****Biomimetics II****Chair: Zhendong DAI**, Nanjing University of Aeronautics and Astronautics, China**15:50-16:15 Invited****Bioinspiration on eccentric structure characteristics and mechanical properties of tamarisk (Tamarix Aphylla)**

Zhiwu HAN, Yin WEI, Junqiu ZHANG, Luquan REN

*Key Laboratory of Bionic Engineering, Ministry of Education, Jilin University, China***16:15-16:35****Adhesion characteristics of polymeric plants leaf replicas: influence of micro-structuring, morphology, and intricacy**Charchit KUMAR¹, Thomas SPECK¹, Holger F. BOHN¹, Vincent LE HOUEROU²¹University of Freiburg, Germany; ²University of Strasbourg, France**16:35-16:55****Surface contact characteristics of banana Leaves**Mariyam Jameelah GHAZALI¹, Hasrawati Abu HASSAN¹, Che HusnaAZHARIL¹, Cevdet MERIC²¹Universiti Kebangsaan Malaysia, Malaysia; ²Fatih university, Turkey

16:55-17:15

Taro-leaf-inspired patterning of Oleophobic surfaces with high wear resistance

Hiroshi TANI, Naoya YAMASHITA, Shinji KOGANEZAWA, Norio TAGAWA
*Kansai University, Japan***17:15-17:35**

A Study on the wettability of sphagnum moss surface

Tianchi CHEN, Hongtao LIU

*China University of Mining and Technology, China***17:35-18:15**

Revealing secrets of staying on water surface based on shadow method

Hongyu LU, Wei YIN, Yelong ZHENG, Dashuai TAO, Yu TIAN

*Tsinghua University, China***18:15-18:35**

Oleophilicity behaviour of fresh and dry pistia stratiotes

Salmiah KASOLANG¹, Najibah AB. LATIF¹¹University Teknologi Mara, Mara; ²Malaysian Tribology Society Mytribos, Maraa**Room 303****Track5: Tribology in Manufacturing
Machining I****Chair: Braham PRAKASH, Lulea University of Technology, Sweden****13:30-14:00 Keynote**

Extreme surface layers – a concept for future tribology

Mitjan KALIN

*University of Ljubljana, Slovenia***14:00-14:20**

Development of an ultra-high speed air bearing spindle for micro-milling

Takuya AOTSUKA, Masaaki MIYATAKE, Shigeka YOSHIMOTO

*Tokyo University of Science, Japan***14:20-14:40**

Cutting tools and wear protection through nickel bonded Niobium Carbide (NbC) as a substitute for cobalt bonded tungsten carbide (WC)

Mathias WOYDT¹, Shuigen HUANG², Jef VLEUGELS², Hardy MOHRBACHER³¹Federal Institute for Materials Research and Testing BAM, Germany;²Katholieke Universiteit Leuven, The Kingdom Of Belgium; ³NiobelCon bvba, The Kingdom of Belgium**14:40-15:00**

Machining influence on cemented tungsten carbide (WC-CoNi) by ultra-short pulse laser

Shiqi FANG^{2,3,4}, Chia-Jui HSU⁵, Sven KLEIN⁴, Luis LLANES^{2,3}, Dirk BÄHRE⁴, Frank MÜCKLICH⁵¹CIEFMA-Departament de Ciència del Materials i Enginyeria Metal·lúrgica,Spain; ²CIEFMA – Dept. Materials Science and Engineering, UniversitatPolitécnica de Catalunya, EEBE-Campus Diagonal Besòs, Spain; ³Barcelona

Research Center in Multiscale Science and Engineering, Universitat Politècnica

de Catalunya, Spain; ⁴Institute of Production Engineering, Saarland University,Germany; ⁵Institute of Functional Materials, Saarland University, Germany**15:00-15:20**

Development of tapping tool coated with nickel/abrasive particle composite film for preventing chip snarling

Yasuyoshi SAITO¹, Takeshi YAMAGUCHI¹, Ryo ITAGAKI¹, Kei SHIBATA¹,Takeshi KUBO², Wataru WATANABE², Satoru OYAMA², Kazuo HOKKIRIGAWA¹¹Tohoku University, Japan; ²MIYAGITANOI MFG. CO., LTD, Japan**15:20-15:50**

Coffee Break

Room 303**Track5: Tribology in Manufacturing
Machining II****Chair: Mitjan KALIN, University of Ljubljana, Slovenia****15:50-16:15 Invited**

High temperature tribology in metalworking processes

Braham PRAKASH

*Lulea University of Technology, Sweden***16:15-16:35**

Contact deformation behavior of silicone/SiC soft elastic abrasive in grinding and polishing progress

Ning LI

*Zhejiang Normal University, China***16:35-16:55**

Study on cryogenic and high speed grinding manufacturing method for high-precision flexible polymer film

Shangxiong ZHANG¹, Ying YAN¹, Xiaoguang GUO¹, Ping ZHOU¹, Huiping WANG²¹Dalian University of Technology, China; ²Dalian Jiaotong University, China**16:55-17:15**

Effect of surface texturing on tribological performance and lubricant infiltration at tool-chip interface

Jiaxin YE, Xiaojun LIU, Minghua PANG, Kun LIU

*Hefei University of Technology, China***17:15-17:35**

The lubricity of organic phosphate esters type additives on titanium alloys

Yan WANG, Chenhui ZHANG, Ye YANG, Jianbin LUO

*State Key Laboratory of Tribology, Tsinghua University, China***Room 305E****Track6: Engine and Transmission Tribology
Rolling Bearings I****Chair: Xiaoyang CHEN, Shanghai University, China****13:30-14:00 Keynote**

Trend of rolling machine elements for automotive transmission

Hirotoshi ARAMAKI

*NSK, Japan***14:00-14:20**

Evolution of microstructure formed from nitrocarburizing of bearing cage and its countermeasures

Bin LIU, Changjian GUO

C&U GROUP CO.LTD., China

14:20-14:40**Effect of the defects in races on the dynamic behavior of ball bearing**

Ziqiang ZHAO, Xuebin YIN, Wenzhong WANG

*Beijing Institute of Technology, China***14:40-15:00****The influence of tribolayer development on micropitting in bearing contacts**Victor BRIZMER¹, Christine MATTA¹, Ileana NEDELCU¹, Bo HAN², Guillermo Enrique MORALES-ESPEJEL^{1,3}¹SKF B.V., Netherlands; ²SKF Global Technical Center China, China; ³Université de Lyon, INSA-Lyon, CNRS LaMCoS, France**15:00-15:20****Formation of white etching cracks in rolling bearing steel: root causes and their relationship to premature bearing failures**

Francesco MANIERI, Amir KADIRIC

*Imperial College, UK***15:20-15:50****Coffee Break****Room 305E****Track6: Engine and Transmission Tribology
Rolling Bearings II****Chair: Ning REN, Valvoline Co., USA****15:50-16:10****Effect of residual stress on the damage accumulation evolution of M50 steel during rolling contact fatigue**

Jian GUAN, Liqin WANG, Xinxin MA

*Harbin Institute of Technology, China***16:10-16:30****Evolution of rolling contact fatigue microstructure alterations in 100Cr6 martensitic bearings**Viktorija SMELOVA¹, Alexander SCHWEDT², Ling WANG¹, Joachim MAYER², Walter HOLWEGGER^{1,3}¹University of Southampton, UK; ²RWTH Aachen University, Germany;³Schaeffler Group, Germany**16:30-16:50****Experimental investigations of rolling element bearings exposed to centrifugal load at a centripetal acceleration up to 3000 times gravity**David HOCHREIN¹, Stephan TREMMEL¹, Oliver GRAF-GOLLER², Sandro WARTZACK¹¹Lehrstuhl für Konstruktionstechnik, Germany; ²Schaeffler Technologies AG & Co.KG, Germany**16:50-17:10****Propagation of surface initiated rolling contact fatigue cracks in bearing steels**

Amir KADIRIC, Pawel RYCERZ

*Imperial College London, UK***17:10-17:30****Influencing factors on rolling contact fatigue life in hydrogen gas**

Yuanlin KOU, Hao YAO, Hiroki YAMADA, Hideyuki UYAMA

*NSK, Japan***17:30-17:50****Hydrogen embrittlement in rolling bearing steel and its protection: application case study**

Xiaobo ZHOU

*SKF, Netherlands***17:50-18:10****An experimental study into the mechanism of false brinelling contact damage and potential preventative measures**

Rachel JANUSZEWSKI, Amir KADIRIC

*Imperial College, UK***18:10-18:30****Simulation on the influence of prestress on the fatigue life of flexible bearing in harmonic drive**Yazhen WANG¹, Yi JIANG¹, Qun TONG², Dashi SU², Li SONG²¹Shanghai University, China; ²Technology Centre of Cixing Bearing GROUP CO. LTD, China**Room 307****Track6: Engine and Transmission Tribology****Fluid-film Bearings I****Chair: Michel FILLON, University of Poitiers, France****13:30-13:55 Invited****Hydro dynamic bearings with soft textured layers:****Effects on oscillating motion and start stop conditions**

BJØRN HAUGEN

*Norwegian University of Technology and Science, Norway***13:55-14:20 Invited****On lubricating film building by limited lubricant supply (LLS) and interface effect**Feng GUO¹, Shuyan ZANG¹, Pat Lam WONG², Chao LI¹¹Qingdao University of Technology, China; ²City University of Hong Kong, China**14:20-14:40****Research of oil film incremental effect by truncating the surface roughness under EHL conditions**

Hiroaki TAKEUCHI

*Mitsubishi Heavy Industries, Japan***14:40-15:00****Effect of Reynolds number on the static characteristics of fully textured journal bearings**

Hiroo TAURA, Hiroyuki YAMADA, Satoru KANEKO

*Nagaoka University of Technology, Japan***15:00-15:20****A large-scale simulation of elastohydrodynamic lubrication in journal bearings with many-core architectures**

Hiroki FUKAGAWA, Kazuyuki YAGI

*Kyushu University, Japan***15:20-15:50****Coffee Break**

Room 307

Track6: Engine and Transmission Tribology

Fluid-film Bearings II

Chair: Benyebka BOU-SAID, INSA Lyon, France

15:50-16:10

Investigation of textured bearings effects on vibrations of small-sized rotors

Jocelyn REBUFA¹, Fabrice THOUVEREZ¹, Erick LE GUYADEC², Denis MAZUYER¹¹Ecole Centrale de Lyon, France; ²CEA, DEN - DTEC, France

16:10-16:30

An experimental investigation of the influence of lubricant supply parameters and groove geometry on the performance of circumferential groove journal bearings

Alex-Florian CRISTEA¹, Jean BOUYER², Michel FILLON², Mircea PASCOVICI³¹Tecnitas SAS, France; ²University of Poitiers, France; ³University Politehnica of Bucharest, Romania

16:30-16:50

Load capacity and stability analysis of partial slip texture multi-lobe journal bearings

T. V. V. L. N. RAO¹, A. M. A. RANI², N. M. MOHAMED², H. H. YA², M. AWANG², F. M. HASHIM²¹The LNM Institute of Information Technology, India; ²Universiti Teknologi PETRONAS, Malaysia

16:50-17:10

Effects of the recess geometry on flow characteristics of cryogenic hybrid journal bearings for rocket turbopumps

Mamoru OIKE¹, Masataka KIKUCHI², Satoshi TAKADA², Takayuki SUDO², Tomoyuki TAKANO³¹Ishinomaki Senshu University, Japan; ²Japan Aerospace Exploration Agency, Japan; ³Japan Aerospace Technology, Japan

17:10-17:30

Journal bearing with a double conical form – a numerical and experimental study

Balint PAP¹, Michel FILLON¹, Patrice GÉDIN², Guillaume BECK²¹University of Poitiers, France; ²Safran Transmission Systems, France

17:30-17:50

Characteristics of non-contact handling equipment using ultrasonic levitation

Kentaro MITA¹, Masaaki MIYATAKE¹, Mark ATHARTON², Cristinel MARES², Shigeka YOSHIMOTO¹, Tadeusz STOLARSKI²¹Tokyo University of Science, Japan; ²Brunel University London, UK

17:50-18:10

Investigation of the effect of a non-isothermal flow of the non-newtonian fluid in the thin layer on the dynamics of the flexible rotor of the turbo-machinery

Elena ZADOROZHNYAYA, Igor LEVANOVA, Nadezhda KHOZENIUK, Vlad HUDYAKOV

South Ural State University, Russia

Room 308

Track7: Industrial Tribo-systems

Hard Disk Drives and Microsystems I

Chair: Takashi NAKAMURA, Nagoya Institute of Technology, Japan

13:30-13:55 Invited

A review of tribology in hard drives

Min YANG

Bruker Corporation, United States

13:55-14:15

Nitrogen plasma treatment for continuous ultra-thin carbon nitride film on magnetic hard disk

Wah Lawrence NG^{1,2}, Amalina Balqis BINTI ABU BAKAR¹, Mohammad Azrul Firdhaus BIN AZMI¹, Wee Shen KHOO¹, Yonggang MENG²¹Fuji Electric (Malaysia) Sdn. Bhd., Malaysia; ²Tsinghua University, China

14:15-14:35

Transport of hydrocarbon and organic contamination to the head-disk interface in magnetic recording devices

Raman VEDANTHAM

Western Digital Corporation, United States

14:35-14:55

Study of the formation and break of lubricant bridge in the head disk interface using molecular dynamic method

Xiangyu DAI¹, Hui LI¹, Shengnan SHEN¹, Xiao LEI¹, Sen LIU¹, Hejun DU²¹Wuhan University, China; ²Nanyang Technology University, China

14:55-15:15

Heat transfer in the air bearing film in magnetic disk drive with a void on the slider surface

Yaru SUN¹, Baojun SHI¹, Cancan JI¹, Zisen HUA², Chuanwei ZHANG³¹Shandong Jianzhu University, China; ²Shandong University, China; ³Harbin Institute of Technology, China

15:30-15:50

Coffee Break

Room 308

Track7: Industrial Tribo-systems

Hard Disk Drives and Microsystems II

Chair: Min YANG, Bruker Corporation, United States

15:50-16:10

Influence of accommodation coefficients on thermo-molecular gas-film lubrication (t-MGL) characteristics -analysis in the free molecular limit-

Shigehisa FUKUI, Shoma SHIMIZU, Ryota ASADA, Fumiya SHINOHARA, Satoru MAEGAWA, Hiroshige MATSUOKA

Tottori University, Japan

16:10-16:30

Modification of friction surface of piezoelectric actuators

Raimundas RUKUIZA¹, Juozas PADGURSKAS¹, Valentin MIHAILOV², Audrius ZUNDA¹, Albinas ANDRIUSIS¹¹Aleksandras Stulginskis University, Lithuania; ²Institute of Applied Physics, Republic of Moldova

16:30-16:50

Detection and classification of magnetic disk surface defects using a contact sensor integrated into a magnetic head in a hard disk drive

Ning LI¹, Saurabh DEORAS¹, Shunji KATSUMI², Jorge ESCOBAR¹, Mitchell POURROY¹, Abhishek SRIVASTAVA¹, Vedantham RAMAN¹

¹Western Digital Corporation, United States; ²Western Digital Corporation, Japan

16:50-17:10

Numerical and experimental study of the head/disk interface in heat assisted magnetic recording using tip enhanced Raman spectroscopy
Longqiu LI^{1,2}, Qingkang LIU¹, Benjamin SUEN², Kaipeng LIU¹, Andrew KING³, Frank E. TALKE²

¹Harbin Institute of Technology, China; ²University of California, USA;

³Renishaw Inc., USA

17:10-17:30

Ultra-sensitive contact detection for hard disk drives

Shaomin XIONG, Erhard SCHRECK

Western Digital Company, United States

17:30-17:50

Modified model of molecular gas film lubrication equation for simulating ultra-thin gas film lubrication

Kai GUO, Baojun SHI, Shipeng HAO, Yaru SUN, Yujie FENG

Shandong Jianzhu University, China

Room 311A**Track 8: Tribotest and Monitoring****Tribotest I**

Chair: Yuanqiang TAN, Huaqiao University, China

13:30-14:00 Keynote

Experimental rigs for testing components of advanced industrial applications

Enrico CIULLI

University of Pisa, Italy

14:00-14:20

Positron annihilation studies of subsurface zones created during friction in metals and their alloys

Jerzy Jerzy DRYZEK

Institute of Nuclear Physics Polish Academy of Sciences, Poland

14:20-14:40

Friction dissipation under tangential high frequency excitation

Per LINDHOLM¹, Krystof KRYNISKI¹, Su ZHAO¹, Åsa Kassman RUDOLPHI²

¹ABB, Sweden; ²Uppsala University, Sweden

14:40-15:00

Tribology with Extended Stribeck Curves: Lubes, Cosmetics, Food and Beverages

Kartik PONDICHERRY, Charlotte REPPICH, Florian RUMMEL

Anton Paar GmbH, Austria

15:00-15:20

Simulation of initial conformability and seizure on tribo-test machine

Kotaro OKUSHI, Patrick BONNAU, Ryuji MIURA, Ai SUZUKI, Naoto MIYAMOTO, Nozomu HATAKEYAMA, Akira MIYAMOTO, Tomomi HOND

Tohoku University, Japan

15:20-15:50

Coffee Break

Room 311A**Track 8: Tribotest and Monitoring****Tribotest II**

Chair: George TY WAN, Fuchs Lubricants (China) Ltd

15:50-16:15 Invited

Benchmark brake material screening: can we ever correlate with full-scale results?

Steve SHAFFER¹, Peter FILIP², Chuck GREENING³

¹Brüker - TSOM, United States; ²Southern Illinois University, United States;

³Greening Test Labs, United States

16:15-16:35

Study of surface roughness and surface orientation on friction in rolling/sliding contacts: barrel-on-disc versus twin-disc

Bergseth ELLEN¹, Söderberg ANDERS¹, ZhuYI², Olofsson ULF¹

¹KTH Royal Institute of technology, Sweden; ²Zhejiang University, China

16:35-16:55

The influence of crystallographic orientation on triboluminescence properties

Kuifang WANG, Liran MA

Tsinghua University, China

16:55-17:15

Comparison of wear methods based on AFM: Line-scanning and area-scanning

Peng ZHANG, Cheng CHEN, Chen XIAO, Lei CHEN, Linmao QIAN

Southwest Jiaotong University, China

17:15-17:35

Estimation of lubricity of green and commercial cutting fluid using tool chip tribometer

Suvin P S, V.Kailas SATISH

Indian Institute of Science, India

17:35-17:55

Study on mechanical properties of interface between silicate glass and stainless steel based on nanoindentation

Haosheng PANG, Chenghui GAO, Ming LIU

Fuzhou University, China

17:55-18:15

Experimental study into the influence of contact conditions and lubricant properties on the onset of scuffing using a new contra-rotation test method

Bo PENG, Guoquan HUANG, Amir KADIRIC

Imperial College London, United Kingdom

18:15-18:35

Tribo-test of high speed ball bearings under the cryogenic environment for turbo pump of liquid rocket engine

Yongbok LEE¹, Wonil KWAK², Bokseong CHO¹

¹Korea Institute of Science and Technology, Seoul, Korea; ²Korea Institute of Science and Technology-UST, Seoul, Korea



Room 201A**Track1: Science of Tribology****Friction Fundamental III****Chair: Mark ROBBINS**, *The Johns Hopkins University, USA***10:10-10:35 Invited****Electrotunable friction with ionic liquid nanoscale films**Michael URBACH¹, Oscar FAJARDO¹, Fernando BRESME², Alexei KORNYSHEV²¹Tel Aviv University, Israel; ²Imperial College, UK**10:35-11:00 Invited****Theory and simulation of nanoscale dissipation and friction**

Erio TOSATTI

*SISSA, Italy***11:00-11:20****Friction of textured surfaces in dry elastic contacts**

M. S. BOBBI, Muthu Kumar MARIAPPAN

*Indian Institute of Science, India***11:20-11:40****Generation of friction anisotropy by surface texturing under boundary lubrication**

Shota ITO, Yuki HIRATA, Shinya, SASAKI

*Tokyo University of Science, Japan***11:40-12:00****Modeling interlayer interactions in layered materials**

Oded HOD

*Tel Aviv University, Israel***12:15-13:30****Lunch****Room 201A****Track1: Science of Tribology****Friction Fundamental IV****Chair: Nir KAMPF**, *Weizmann Institute of Science, Israel***13:30-14:00 Keynote****Modeling of energy dissipation due to adhesion in normal and sliding contacts**

Irina G. GORYACHEVA

*Institute for Problems in Mechanics, Russian Academy of Science, Russia***14:00-14:30 Keynote****Sliding bearings in wind turbines**Georg JACOBS¹, Ralf SCHELENZ¹, Dennis WITTER², Dennis BOSSE¹, Tim SCHRÖDER¹¹RWTH Aachen University, Germany; ²IME Aachen GmbH, Germany**14:30-14:50****Simulation of compliant third-bodies with a multibody meshfree approach**

Guilhem MOLLON

*INSA-Lyon, France***14:50-15:10****Fundamental simulations and experiments on tribological systems with partially filled gaps**

Michael MUELLER, Georg-Peter OSTERMEYER

*Braunschweig University of Technology, Germany***15:10-15:30****Scientific scaling-up from molecular dynamics simulation to friction behavior prediction**Shuaihang PAN¹, Nian YIN², Zhinan ZHANG²¹University of California-Los Angeles, USA; ²Shanghai Jiao Tong University, China**15:30-16:30****Coffee Break & Poster Time****Room 201A****Track1: Science of Tribology****Friction Fundamental V****Chair: Erio TOSATTI**, *SISSA, Italy***16:30-16:55 Invited****Nanotribology of cationic surfactants**

Nir KAMPF

*Weizmann Institute of Science, Israel***16:55-17:15****Real time TEM observation of metallic nano-asperity friction**

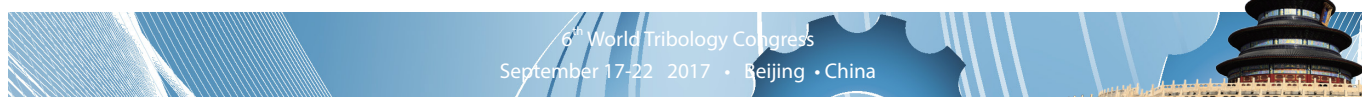
Takaaki SATO, Menon VIVEK, Hiroyuki FUJITA

*University of Tokyo, Japan***17:15-17:35****Temperature and velocity dependences in the prandtl/tomlinson model for atomic sliding friction**Wilfred TYSOE¹, Octavio FURLONG², Sergio MANZI²¹University of Wisconsin-Milwaukee, USA; ²National University of San Luis, Argentina**17:35-17:55****Evolution of wear and roughness in mixed lubrication regime**Nilanjan DAS CHAKLADAR¹, Leiming GAO², Richard M HALL¹, Rob HEWSON²¹University of Leeds, UK; ²Imperial College London, UK**17:55-18:15****Liquid-infused surface in active controlled patterned microfluidic device**

Yongjian LI, Yang GAO, Haosheng CHEN

*Tsinghua University, China***18:15-18:35****Microstructure evolution of impact contact surface layer in quasi-nanometer wear mechanisms**Xianghong REN^{1,2}¹Xi'an Jiaotong University, China; ²Xi'an Research Inst. of High-tech., China**Room 201B****Track1: Science of Tribology****Elastohydrodynamic Lubrication I****Chair: Markus VALTINER**, *Max-Planck-Institut f. Eisenforschung GmbH, Germany***10:10-10:40 Keynote****Dimensionless parameters in lubrication**

Antonius LUBRECHT

*INSA-Lyon, France***10:40-11:00****Variation of surface dimple in EHL contacts by the effect of oil starvation**Jing WANG¹, Xianghua MENG¹, Shun CUI¹, Binbin ZHANG²¹Qindao Technological University, China; ²University of Twente, Netherlands

11:00-11:20

Film formation and friction in grease lubricated contacts

Yuta KANAZAWA, Richard S SAYLES, Amir KADIRIC

Imperial College London, UK

11:20-11:40

Experimental study on singular EHL behavior of grease at low speeds

Masataka SAKAI¹, Tsuyoshi KOCHI¹, Daming DONG¹, Yoshitsugu KIMURA^{2,3}
¹Kyodo Yushi CO., LTD, Japan; ²University of Tokyo, Japan; ³Kagawa University, Japan

12:00-13:30

Lunch

Room 201B

Track1: Science of Tribology

Elastohydrodynamic Lubrication II

Chair: Roland LARSSON, Lulea University of Technology, Sweden

13:30-13:50

High pressure and high shear rate contribution on the limiting shear stress of lubricants in EHL

Laetitia MARTINIE¹, Serigne NDIAYE¹, Jérémie MARGUERITAT², David PHILIPPON¹, Philippe VERGNE¹
¹LaMCoS - INSA de Lyon, France; ²Université de Lyon, France

13:50-14:10

A method for solving the equivalent viscosity of non-Newtonian fluid and its application in thermal EHL considering spinning

Xiaoling LIU, Mingming MA, Peiran YANG

Qingdao University of Technology, China

14:10-14:30

Theoretical modelling of film forming mechanisms under transient conditions: application to deceleration and experimental validation

Juliette CAYER-BARRIOZ, Denis MAZUYER, André ERNESTO

Ecole Centrale de Lyon - LTDS - CNRS, France

14:30-14:50

Measurements of lubricant and surface temperatures within an elastohydrodynamic contact

Jia LU, Thomas REDDYHOFF, Daniele DINI

Imperial College London, UK

14:50-15:10

Boundary slippage induced elastohydrodynamic lubrication under zero entrainment velocity

Yang ZHAO^{1,2}, Pat Lam Patrick WONG², Junhong MAO¹
¹Xi'an Jiaotong University, China; ²City University of Hong Kong, China

15:10-15:30

Understanding EHL friction through nonequilibrium molecular dynamics simulations and tribology experiments

James EWEN¹, Chiara GATTINONI³, Neal MORGAN², Hugh SPIKES¹, Daniele DINI¹
¹Imperial College London, UK; ²Shell Global Solutions, UK; ³ETH Zurich, Switzerland

15:30-16:30

Coffee Break & Poster Time

Room 201B

Track1: Science of Tribology

Elastohydrodynamic Lubrication III

Chair: Xiaoli WANG, Beijing Institute of Technology, China

16:30-16:50

Effect of groove topography on the contact behavior in EHL and mixed lubrication. Part 1: experimental

Denis MAZUYER¹, Thomas TOUCHE¹, Tomasz WOLOSZYNSKI², Pawel PODSIADLO², Gwidon STACHOWIAK², Juliette CAYER-BARRIOZ¹
¹Ecole Centrale de Lyon, France; ²Curtin University, Australia

16:50-17:10

Effect of groove topography on the contact behavior in EHL and mixed lubrication. Part 2: numerical simulations

Tomasz WOLOSZYNSKI¹, Thomas TOUCHE², Pawel PODSIADLO¹, Gwidon STACHOWIAK¹, Juliette CAYER-BARRIOZ², Denis MAZUYER²
¹Curtin University, Australia; ²Ecole Centrale de Lyon, France

17:10-17:30

A thermal and transient lubrication model for EHL contacts

Bilel MEZIANE¹, Nicolas FILLOT¹, Guillermo E. MORALES-ESPEJEL^{2,1}
¹INSA Lyon, France; ²SKF Engineering and Research Centre, Netherlands

17:30-17:50

A molecular dynamics study of the limiting shear stress phenomenon in an EHD contact

Alejandro PORRAS-VAZQUEZ, Laetitia MARTINIE, Philippe VERGNE, Nicolas FILLOT

Université de Lyon, INSA Lyon, CNRS, LaMCoS UMR5259, France

17:50-18:10

Behaviour of entrapped oil film in point contact EHL

Hiroshi NISHIKAWA¹, Yuma MITA¹, Nobuyoshi OHNP²
¹Kyushu Institute of Technology, Japan; ²Saga University, Japan

18:10-18:30

Grease distribution under sliding reciprocating motions

Shanshan WANG

Room 201D

Track 2: Wear & Surface Engineering

Wear III

Chair: Ling WANG, University of Southampton, UK

10:10-10:40 Keynote

Design and application of friction pair surface modification coating for remanufacturing

Haidou WANG

Academy of Armored Forces Engineering, China

10:40-11:00

Effects of lay direction and crossing angle on friction and wear behavior of winding hoist rope in ultra-deep coal mine hoist

Xiangdong CHANG¹, Yuxing PENG¹, Zhencai ZHU¹, Xiansheng GONG², Shengyong ZOU^{3,4}, Shisheng SUN¹, Wenxue XU¹
¹China University of Mining and Technology, China; ²Chongqing University, China; ³CITIC Heavy Industries Co. Ltd, China; ⁴Luoyang Mining Machinery Engineering Design Institute, China


11:00-11:20**Study on out-of-roundness wear of wheels of high-speed trains**

Guangxiong CHEN

*Southwest Jiaotong University, China***11:20-11:40****Dynamic Numerical Model for Adhesive Wear in Heavy-loaded****Herringbone Gears with Clearance Grooves**Hongbing WANG¹, Changjiang ZHOU^{1,2}, Yuying LEI¹¹Hunan University, China; ²Central South University, China**11:40-12:00****The influence of abrasive debris on the wear of equipment**

Zhihong HU

*Tsinghua University, China***12:00-12:20****Wear protection in rolling bearings by targeted generation of tribological boundary layers**

Gero BURGHARDT, Georg JACOBS, Andreas STRATMANN

*RWTH Aachen University, Germany***12:00-13:30****Lunch****Room 201D****Track 2: Wear & Surface Engineering****Wear IV****Chair: Robort JK WOOD, University of Southampton, United Kingdom****13:30-13:55 Invited****Exploring carbon-based nanomaterials for enhancing tribological behaviors and mechanical properties**

Yeau-Ren JENG

*Chung Cheng University, Taiwan, China***13:55-14:15****Tribo-investigations of "size effect" of particles of mica in PAEK based short glass fiber reinforced solid lubricated composites**

Jitendra Narayan PANDA, Jayashree BIJWE, Steven SHAFFER

*IIT Delhi, India***14:15-14:35****Numerical investigation on wear and wet-skid resistance of nano-silicon reinforced tread rubber**

Jian WU, Youshan WANG, Chuanbing ZHANG, Benlong SU

*Harbin Institute of Technology, China***14:35-14:55****Abrasive wear resistance of polymers and polymer compounds**

Helena RONKAINEN, Mikko KARTTUNEN, Jani PELTO, Simo VARJUS, Lauri KILPI

*VTT Technical Research Centre of Finland, Finland***14:55-15:15****Influence of the type of abrasive particle and abrasive slurry concentration on the micro-abrasive wear behaviour of an iron aluminide alloy**Felipe CASTILHO¹, Ronaldo COZZA^{1,2}, Gustavo DONATO¹, Claudio SCHOEN³¹University Center of FEI, Brazil; ²State Center of Technological Education "Paula Souza", Brazil; ³University of Sao Paulo, Brazil**15:20-16:30****Coffee Break & Poster Time****Room 201D****Track 2: Wear & Surface Engineering****Wear V****Chair: Jian LI, Wuhan Research Institute of Materials Protection, China****16:30-16:50****Dry sliding wear and friction behavior of self-lubricating polymer composite bearing materials under extreme operating conditions**

Maria RODIOUCHKINA, Kim BERGLUND, Nazanin EMAMI, Roland LARSSON

*Luleå University of Technology, Sweden***16:50-17:10****Fast calculation method for predicting the risk of surface initiated damage in rolling bearings**

Bernd VIERNEUSEL

*Schaeffler Technologies AG Co., KG, Germany***17:10-17:30****Model of contact and wear between high-speed moving parts of piezo-drives**

Yuri KLIGERMAN, Eido ZELIKOV, Haytam KASEM

*Technion - Israel Institute of Technology, Israel***17:30-17:50****Anti-adhesive properties of hierarchical structures and insulating liquid media**

Weixu YANG, Xiaoli WANG, Xintao SONG

*Beijing Institute of Technology, China***17:50-18:10****The wear behavior between marine corroded Al/BN seal coating and Ti-alloy blade under high-speed rubbing condition**Jiaping ZHANG^{1,2}, Deli DUAN¹¹Institute of Metal Research, China; ²Shenyang Liming Aero-Engine Group Corporation LTD., China**18:10-18:30****Localized fretting corrosion behavior of micro-arc oxidation coating on AZ31 alloy in simulated body fluid**

Yanhong GU, Huijuan MA

*Beijing Institute of Petrochemical Technology, China***Room 203A****Track 2: Wear & Surface Engineering****Coatings III****Chair: Huaiyuan WANG, Northeast Petroleum University, China****10:10-10:35 Invited****Effect of ceramic counterpart material on wear properties of a-C:H coating under dry condition at various temperatures**

Noritsugu UMEHARA

*Nagoya University, Japan***10:35-10:55****Control of surface temperature during run-in for low friction of carbon nitride coatings under room temperature in air**Mamoru MIURA¹, Naohiro YAMADA¹, Tomomi WATARI², Takanori TAKENO¹, Koshi ADACHI²¹Tohoku University, Japan; ²Shimadzu Corporation, Japan

10:55-11:15

DLC deposited onto nitrided gray and nodular cast iron substrates: an unexpected tribological behaviour

Renan GIACOMELLI, Diego SALVARO, Cristiano BINDER, Aloisio N. KLEIN, Jose Daniel DE MELLO
Universidade Federal de Santa Catarina, Brazil

11:15-11:35

Effects of oxygen and water on friction and wear of DLC slid against pure metals

Keisuke MANABE, Hiroyoshi TANAKA, Joichi SUGIMURA
Kyushu University, Japan

11:35-11:55

Frictional behavior of oxygen doped carbon films prepared by ion irradiation assisted sputtering deposition

Meiling GUO¹, Dongfeng DIAO², Lei YANG³
¹Xi'an University of Technology, China; ²Shenzhen University, China; ³Xi'an Jiaotong University, China

11:55-12:15

Investigation on influences of diamond-like carbon coatings and roughness on fretting behaviors of Ti6Al4V material in modular hip implants

Haohao DING, Vincent FRIDRICI, Philippe KAPSA
Laboratoire de Tribologie et Dynamique des Systemes, France

12:15-12:35

Dependence of tribology behavior of carbon films on orientation of graphene nanocrystallites controlled by directional electron beam irradiation

Wencong CHEN, Dongfeng DIAO
Institute of Nanosurface Science and Engineering, China

12:35-13:30

Lunch

Room 203A

Track 2: Wear & Surface Engineering
Coatings IV

Chair: Koshi ADACHI, Tohoku University, Japan

13:30-13:55 Invited

Roles of MoS₂, DLC coatings and graphene in reducing adhesion under different atmospheres and temperatures

Guanhong SUN, Z. YANG, Sukanta BHOWMICK, Ahmet ALPAS
University of Windsor, Canada

13:55-14:15

Experiment Study on effects of graphene on tribological properties of MoS₂ coating

Huali HAN, Fanming MENG, Chengzhang YANG, Ziqi ZHENG
Chongqing University, China

14:15-14:35

Preparation and tribological performance of bonded solid lubrication coating used on spherical plain bearings

Ming QIU^{1,2}, Rui ZHANG¹, Yingchun LI¹, Hui DU¹, Xiaoxu PANG¹
¹Henan University of Science and Technology, China; ²Collaborative Innovation Center of Machinery Equipment Advanced Manufacturing of Henan Province, China

14:35-14:55

Solid-liquid complex lubrication based on novel graphene-MoS₂ coatings with 3D oil reservoir structure

Jinqing WANG^{1,2}, Kaiming HOU^{1,2,3}, Shengrong YANG^{1,2}
¹Lanzhou Institute of Chemical Physics, China; ²Chinese Academy of Sciences, China; ³University of Chinese Academy of Sciences, China

14:55-15:15

Frictional behavior and lubricant mechanism of nanostructural Mo-S-C films in different sliding conditions

Jiao XU, Tengfei He, Liqiang CHAI, Qiao LI, Xiaoqin ZHANG, Peng WANG
Chinese Academy of Sciences, China

15:15-15:35

Tribological properties of Ni-based composite coatings containing silver vanadate at elevated temperatures

Jun WANG, Jianliang LI, Dangsheng XIONG, Xuejun WANG, Hang LI
Nanjing University of Science and Technology, China

15:35-16:30

Coffee Break & Poster Time

Room 203A

Track 2: Wear & Surface Engineering
Coatings V

Chair: Fei ZHOU, Nanjing University of Aeronautics and Astronautics, China

16:30-16:50

Effect of self-lubricating coating on the performance of finger seal

Yanchao ZHANG, Chenguang SI, Yahui CUI, Dongya ZHANG, Jianlei WANG
Xi'an University of Technology, China

16:50-17:10

Friction and wear of Ag-doped nanocomposite coatings in wide temperature range

Andrey BONDAREV, Philipp KIRYUKHANTSEV-KORNEEV, Mehran GOLIZADEH, Dmitry SHTANSKY
National University of Science and Technology MISiS, Russia

17:10-17:30

Development of a robust and intelligent nickel composite with self-lubrication, wear resistance and health diagnosis via one-pot electrodeposition

Nan ZHOU¹, Shuncai WANG¹, Frank WALSH²
¹National Centre for Advanced Tribology at Southampton, University of Southampton, UK; ²Research Institute for Industry, University of Southampton, UK

17:30-17:50

New development and in-situ analysis of a multi-hydrophobic coating methodology

Helen WANG^{1,3}, Michael FIIEDNER², Thomas OBERBILLING², Wolfgang WEINHOLD³
¹AMT China Co. Ltd., China; ²COTEC GmbH, China; ³Innowep GmbH, Germany

17:50-18:10

A universal model for an elastic-plastic coated spherical contact with moderate to large coating thicknesses

Zhou CHEN, Roman GOLTSBERG, Izhak ETSION
Technion, Israel


18:10-18:30

Effect of silicon content on the microstructure and wear resistance of FeCoCrNiMoSix high entropy alloy coatings

Yanwen TIAN, Hong WU

Central South University, China

Room 203B

Track 2: Wear & Surface Engineering

Texturing III

Chair: Gachot CARSTEN, Vienna University of Technology, Austria

10:10-10:30

The effect of surface texture on the oil film forming in journal bearings

Jaroslav SEP¹, Lidia GALDA¹, Leszek TOMCZEWSKI^{1,2}

¹Rzeszow University of Technology, Poland; ²The Jan Grodek State Vocational Academy, Poland

10:30-10:50

Visualising cavitation in a piston ring-liner type contact to understand surface texture behaviour

Sorin-Cristian VLADESCU¹, Khizer TUFAIL², Arup GANGOPADHYAY³, Tom REDDYHOFF¹

¹Imperial College London, United Kingdom; ²Ford Motor Company, United Kingdom; ³Ford Motor Company, United States of America

10:50-11:10

Study on the effects of surface texture on lubrication performance of water lubricated rubber bearing

Jian WANG¹, Zhenglin LIU¹, Yangwu OU¹, Haojiang LIU², Xingxin LIANG¹

¹Wuhan University of Technology, China; ²The NO.713 Research Institute of CSIC, China

11:10-11:30

Coupled tribological effects of laser surface texturing and lubrication

Shuwen WANG, Feiyan YAN, Ao CHEN

University of Shanghai for Science and Technology, China

11:30-11:50

Multi-scale identification of contact parameters across the 3D texture of the finish by honing

Hassan Zahouani & Mohamed El Mansori

Laboratory of Tribology and Dynamics of Systems, University of Lyon, France

11:50-12:10

The use of surface texturing for friction control

Ping LU

University of Southampton, United Kingdom

12:10-12:30

Experimental study of oil spreading characteristics on laser textured substrates at high temperature

Rong WANG, Shaoxian BAI

Zhejiang University of Technology, China

12:30-13:30

Lunch

Room 203B

Track 2: Wear & Surface Engineering

Texturing IV

Chair: Kenneth Holmberg VTT, Finland

13:30-13:50

Tribological behavior of the textured surfaces lubricated with esterified bio-oil with MoS₂ microsheets

Yufu XU, Jian GENG, Tao YOU, Yubin PENG, Karl DEARN, Xianguo HU

Hefei University of Technology, China

13:50-14:10

Computational simulation of frictional temperature rise of textured surfaces under dry sliding condition

Wei WU^{1,2}, Guiming CHEN², Tianmin SHAO¹

¹Tsinghua University, China; ²Xi'an Research Institute of High Technology, China

14:10-14:30

Optimization of irregular texture shape contour based on Genetic Algorithm under unidirectional sliding

Hui ZHANG¹, Guangneng DONG¹, Ligu QIN¹, Meng HUA²

¹Xi'an Jiaotong University, China; ²City University of Hong Kong, China

14:30-14:50

Friction increasing of bionic convex bumps on flexible surfaces

Xuli ZHU, Nannan LIU, Liang LI, Jiefeng MU, Linjing XIAO

Shandong University of Science and Technology, China

14:50-15:10

The effects of surface texture on the start-up behaviors of plain journal bearings

Shuhui CUI, Le GU, Chuanwei ZHANG

Harbin Institute of Technology, China

15:10-15:30

Improving the friction-induced vibration performance by using grooved damping component

Dongwei WANG¹, Jiliang MO¹, Qi ZHANG¹, Huajiang OUYANG², Minhao ZHU¹, Zhongrong ZHOU¹

¹Southwest Jiaotong University, China; ²University of Liverpool, England

15:30-16:30

Coffee Break & Poster Time

Room 203B

Track 2: Wear & Surface Engineering

Texturing V

Chair: Liping WANG, Ningbo Institute of material Research, Chinese Academy of Sciences, China

16:30-16:50

Effect of surface texture on formation of carbon film by adding carbon nanohorns on interface of silicon carbide sliding in water

Xinmei LIU, Hirotuna SATO, Koshi ADACHI

Tohoku University, Japan

16:50-17:10

The effect mechanism of groove-textured surfaces in reducing the friction-induced vibration and noise

Jiliang MO¹, Dongwei WANG¹, Huajiang OUYANG², Guangxiong CHEN¹, Minhao ZHU¹, Zhongrong ZHOU¹

¹Southwest Jiaotong University, China; ²University of Liverpool, England



17:10-17:30

Improvement in slip resistance of rubber sole on oil-lubricated surface by controlling height and orientation of tread block

Takeshi YAMAGUCHI, Yu KATSURASHIMA, Kazuo HOKKIRIGAWA

Tohoku University, Japan

17:30-17:50

Thermoelastohydrodynamic behaviour comparisons of different textured gas face seals at low pressure

Shaopeng DING, Shaoxian BAI

Zhejiang University of Technology, China

17:50-18:10

Tribological properties of alloying techniques to deposit coating on laser texturing surface

Yi WAN¹, Dangsheng XIONG², Jianliang LI²

¹Nanjing University of Aeronautics and Astronautics, China; ²Nanjing University of Science and Technology, China

18:10-18:30

The effect of tooth topography on the tribo-dynamic characteristics of spur gears

Zhi LI, Jian CHEN, Xiaojun LIU, Kun LIU

Hefei University of Technology, China

Room 203C

Track3: Lubrication and Lubricants

Chemistry of lubricants II

Chair: Wilfred TYSOE, *University of Wisconsin-Milwaukee, USA*

10:10-10:35 **Invited**

The mechanochemistry of ultra low wear fluoropolymers

W Gregory SAWYER¹, Angela A PITENIS¹, Kathryn L HARRIS², Brandon A KRIK³

¹Lulea University of Florida, USA; ²Kungliga Tekniska Högskolan (KTH), Sweden;

³Lehigh University, Bethlehem, USA

10:35-10:55

Tribochemical reactions of alkali metal phosphate with iron oxide surfaces from quantum mechanics molecular dynamics QM/MM Level

Thuy Huong TA, Anh Kiet TIEU, Hongtao ZHU, Haibo YU, Dinh Thi TA, Manh Ha LE

University of Wollongong, Australia

10:55-11:15

Tribological characteristic and mechanism analysis of borate ester as a lubricant additive in different base oils

Guangbin YANG, Shengmao ZHANG, Pingyu ZHANG

Henan University, China

11:15-11:35

Influence of the structure of hydrocarbon radicals on the adsorption parameters for lubricant

Lgor MUKCHORTOV, Elena ZADOROZHNYA, Lgor LEVANOVA, Yuri ROZHDESTVENSKY

South Ural State University, Russia

11:35-11:55

Lubricant influences on the formation of white etching cracks (WEC)

Christoph MAYER, Balasubramaniam VENGUDUSAMY, Adam ORENDORZ, Stefan GRUNDEI, Claus ENEKES, Reiner SPALLEK

Klüber Lubrication München SE & Co. KG

11:55-12:15

Comparison between Langmuir-Blodgett films made from additive molecules and adsorbed additive layers from the viewpoint of nanotribological property

Koki Shinohara¹, Tomoko Hirayama^{1,2}, Takashi Matsuoka¹

¹Doshisha University; ²JST Presto

12:30-13:30

Lunch

Room 203C

Track3: Lubrication and Lubricants

Solid lubricants I

Chair: Junyan ZHANG, *Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, China*

13:30-14:00 **Keynote**

In situ created 2D Turbostratic Graphite: A new way to obtain high performance self lubricating composites

José Daniel Biasoli de Mello

Universidade Federal de Uberlândia, Brazil

14:00-14:20

Low friction mechanism of diamond-like carbon in water: a theoretical study

Shandan BAI¹, Jingxiang XU², Yusuke OOTANI², Yuji HIGUCHI², Nobuki OZAWA², Momoji KUBO²

¹Kyocera Corporation, Japan; ²Tohoku University, Japan

14:20-14:40

The synthesis of MoS₂ particles with different morphologies for tribological applications

Meirong YI, Chenhui ZHANG

Tsinghua University, China

14:40-15:00

From nanoscale to macroscale friction reducing enabled by in-suit multilayers graphene formation

Wenbo QIN, Wen YUE, Chengbiao WANG

China University of Geosciences (Beijing), China

15:00-15:20

Study of frictional behaviors of vertically oriented graphene sheets fabricated by electrophoretic deposition

Bin SHEN, Sulin CHEN, Hong HONG

Shanghai Jiao Tong University, China

15:30-16:30

Coffee Break & Poster Time



Room 203C

Track3: Lubrication and Lubricants
Solid lubricants II

Chair: Ning REN, Valvoline Co., USA

16:30-16:55 Invited**Engineering scale superlubricity of carbon films**

Junyan ZHANG

*Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, China***16:55-17:15****Run-in behavior of DLC film at nano scale**

Pengfei SHI

*Southwest University, China***17:15-17:35****Self-assembled graphene film as low friction solid lubricant in macroscale contact**Pu WU¹, Xinming LI², Chenhui ZHANG¹, Xinchun CHEN¹, Shuyuan LIN¹, Zefeng CHEN², Hongyan SUN^{3,4}, Hengte LIN³, Hongwei ZHU¹, Jianbin LUO¹¹*Tsinghua University, China;* ²*The Chinese University of Hong Kong, China;*³*Ningbo Institute of Materials Technology and Engineering, Chinese Academy of Sciences, China;* ⁴*Hunan University, China***17:35-17:55****Effect of multilayer structure of a C/Si film on its tribological properties in solid-liquid composite lubrication system under high temperature**

Bing LI, Yujuan ZHANG, Shengmao ZHANG, Pingyu ZHANG

National & Local Joint Engineering Research Center for Applied Technology of Hybrid Nanomaterials, China

Room 305A

Track3: Lubrication and Lubricants
Additives III

Chair: Hugh SPIKES, Imperial College London, UK

10:10-10:30**Tribochemistry of molybdenum based additives using Raman microscopy on steel/steel and steel/DLC coatings**Cayetano ESPEJO¹, Catherine CHARRIN², Benoît THIÉBAUT², Denis LANÇON², Anne NEVILLE¹, Ardian MORINA¹¹*University of Leeds, UK;* ²*TOTAL. Solaize Researcher Center, France***10:30-10:50****Mechanism of fretting wear reduction using magnesium stearate as lubricant additive under oil lubrication**

Taisuke MARUYAMA, Michita HOKAO

*NSK Ltd., Japan***10:50-11:10****The effect of UV irradiation to a-C:H on friction and wear properties under PAO oil lubrication including MoDTC and ZnDTP**

Mohd Taugik BIN TAIB, Noritsugu UMEHARA, Motoyuki MURASHIMA

*Nagoya University, Japan***11:10-11:30****Effect of water-based lubricants on multi-degradation of austenitic stainless steel**

Amin HOSSEIN ZAVIEH, Nuria ESPALLARGAS

*Norwegian university of science and technology, Norway***11:30-11:50****The tribological properties of sulfur-and-phosphorus-free organic molybdenum compounds as additives in oil**Wenjuan HUAI, Yanxu WANG, Yuanjing DAI, Jiping ZHANG, Chenhui ZHANG
*Tianjin Research Institute for Advanced Equipment, Tsinghua University, China***11:50-12:10****Effect of graphene as oil additives on the frictional behavior of GCr15 steel during sliding contact**

Lupeng WU, Chuanwei ZHANG, Zhijie XIE, Le GU

*Harbin Institute of Technology, China***12:10-12:30****New sight into the tribological mechanism of cerium oxide nanoparticles**

Lili WU, Shengmao ZHANG, Pingyu ZHANG

*National & Local Joint Engineering Research Center, China***12:30-13:30****Lunch**

Room 305A

Track3: Lubrication and Lubricants
Additives IV

Chair: Petr SPERKA, Brno University of Technology

13:30-13:50**Microstructure and antioxidant behavior of mesoporous silica nanospheres as potential antioxidant of synthetic ester lubricant oil**

Lina HUANG, Shengmao ZHANG, Pingyu ZHANG

*National & Local Joint Engineering Research Center for Applied Technology of Hybrid Nanomaterials, China***13:50-14:10****Tribological properties of tungsten disulfide nanoparticles surface-capped by oleylamine and maleic anhydride dodecyl ester as additive in diisooctylsebacate**

Zhengquan JIANG, Shengmao ZHANG, Pingyu ZHANG

*Henan University, China***14:10-14:30****The graphene as friction reduction and antiwear additive in polyphosphate lubricant for elevated rubbing surfaces**

Ning KONG, Shanshan LIU, Hongbo LI, Jie ZHANG

*University of Science and Technology Beijing, China***14:30-14:50****Study of the tribological behavior and the adsorption mechanism of fatty amines and derivatives**Toni MASSOUD¹, Rafael PEREIRA DE MATOS¹, Thierry LE MOGNE¹, Manuel COBIAN¹, Michel BELIN¹, Benoît THIÉBAUT², Sophie LOEHLÉ², Franck DAHLEM¹, Clotilde MINFRAY¹¹*CNRS-UMR 5513, France;* ²*Total-Centre de Recherche de Solaize, France***14:50-15:10****Stress-induced reticulation of unsaturated fatty acid fuel additives under boundary lubrication**Jean Michel MARTIN¹, Maria Isabel DE BAFFOS BOUCHET¹, Cyrielle FOREST¹, Jose AVILA², Michaël MAZARIN³, Maria Carmen ASENSIO²¹*University of Lyon, France;* ²*University Paris-Saclay, France;* ³*TOTAL, France*

15:10-15:30

Inorganic nano/submicrospheres grown by in-situ laser irradiation for enhanced tribology performance

Ting LUO, Bingqiang CAO

University of Jinan, China

15:30-16:30

Coffee Break & Poster Time

Room 305A

Track3: Lubrication and Lubricants

Additives V

Chair: Fabrice DASSENNOY, Ecole Centrale de Lyon, France

16:30-16:50

Friction characteristics of environmentally adapted lubricants in boundary lubricated contacts

Kim BERGLUND, Yijun SHI

Lulea University of Technology, Sweden

16:50-17:10

Tribological performance of environmentally acceptable lubricants composed of various fatty acids

Szymon BERNAT¹, Nuria ESPALLARGAS¹, Sergio ARMADA²

¹Norwegian University of Science and Technology, Norway; ²SINTEF, Norway

17:10-17:30

Tribological properties of nitrided steel lubricated with fully formulated oils in boundary lubrication conditions

Hiroto AOTA¹, Aya SHINGAI², Yukio TAMURA¹, Hiroshi YAMAMOTO¹, Shinji TANAKA², Masao KIKUCHI^{1,2}, Masabumi MASUKO²

¹Komatsu Ltd, Japan; ²Tokyo Institute of Technology, Japan

17:30-17:50

The oil additives effects on the friction property of rubbers

Ryota ASHIZAWA¹, Tasuku ONODERA¹, Yoshie SAKAI², Hiroaki TACHIBANA²

¹Hitachi, Ltd, Japan; ²Hitachi Automotive Systems, Ltd., Japan

17:50-18:10

Tribological performance of MoS₂/CNTs composite as lubricant additive in ester based oil

Jincan YAN, Wei SONG, Jiahua MAI, Hongbing JI

Sun Yat-sen University, China

18:10-18:30

Improving the performance of water-based lubrication system by ultrathin MoS₂ exfoliated by biological proteins

Lei LIU, Zhengquan LEI, Wei ZOU

Southeast University, China

Room 305C

Track4: Biotribology & Biomimetics

Artificial Joints I

Chair: Teruo MURAKAMI, Teikyo University, Japan

10:10-10:35 **Invited**

Ceramic multilayer coating under high demanding activities knee wear simulation

Thomas M. GRUPP, Bernhard FRITZ, Jens SCHWIESAU, Ana Laura Puente REYNA

Aesculap AG Research and Development, Tuttlingen 78532, Germany

10:35-10:55

Coordinate based methodology for wear and creep assessment of polyethylene tibial knee inserts in total knee replacement

Wei JIANG¹, Zhongmin JIN^{2,3}, Cuicui JI⁴

¹Changzhou Institute of Technology, China; ²University of Leeds, England;

³Southwest Jiaotong University, China; ⁴Hohai University, China

10:55-11:15

Effect of loading conditions on wear of polyethylene total hip joint replacements: A putational formulation

Feng LIU, Lei DONG, Li FENG, Junyuan WANG

North University of China, China

11:15-11:35

Toward minimizing wear in prosthetic socket by optimizing reliefs areas

Gabi NEHME

University of Balamand, Lebanon

11:35-11:55

Influence of acetabular cup inclination on wear of UHMWPE liner

Matúš RANUŠA¹, Martin VRBKA¹, Jiří GALLO², Ivan KRUPKA¹, Martin HARTL¹

¹Brno University of Technology, Czech; ²University Hospital Olomouc, Czech

11:55-12:15

Fiber reinforcement promotes biphasic lubrication of PVA hydrogel as an artificial cartilage material

Nobuo SAKAI¹, Chie HASHIMOTO¹, Seido YARIMITSU², Yoshinori SAWAE³, Teruo MURAKAMI⁴

¹Kyushu Institute of Technology, Japan; ²Tokyo Metropolitan University, Japan;

³Kyushu University, Japan; ⁴Teikyo University, Japan

12:15-13:30

Lunch

Room 305C

Track4: Biotribology & Biomimetics

Artificial Joints II

Chair: Thomas M. GRUPP, Aesculap AG Research and Development,

Tuttlingen 78532, Germany

13:30-14:00 **Keynote**

Biomimetic articular cartilage and biotribology properties

Shirong GE

China University of Mining & Technology, China

14:00-14:20

Evaluation of friction properties of polyvinyl alcohol/graphene oxide hydrogels as articular cartilage replacement

Yan Brandon SHI, Dangsheng XIONG, Jianliang LI

Nanjing University of Science and Technology, China

14:20-14:40

Chemical and physical surface modification on polycarbonate urethane to reduce its friction against cartilage to make a durable permanent meniscus

Prashant SHARMA, Irene SCHIAVON, Sara EHSANI MAJD, Hans KAPER

University of Groningen and University Medical Center Groningen, Holland



14:40-15:00**"Tribological behaviors of PEEK-coated titanium alloys in contact with ZrO₂ counterbodies**Jian SONG¹, Yuhong LIU¹, Zhenhuha LIAO², Yiqin DUAN¹, Weiqiang LIU¹, Xiaohong MU³¹Tsinghua University, China; ²Research Institute of Tsinghua University in Shenzhen, China; ³Dongzhimen Hospital Affiliated to Beijing University of Chinese Medicine, China**15:30-16:30**

Coffee Break & Poster Time

Room 305C**Track4: Biotribology & Biomimetics****Artificial Joints III****Chair: Shirong GE, China University of Mining & Technology, China****16:30-16:55 Invited****Superior lubricity of poly(vinyl alcohol) hydrogels as artificial cartilage with adaptive multimode lubrication**Teruo MURAKAMI¹, Seido YARIMITSU², Nobuo SAKAI³, Kazuhiro NAKASHIMA⁴, Tetsuo YAMAGUCHI⁴, Yoshinori SAWAE⁴, Atsushi SUZUKI⁵¹Teikyo University, Japan; ²Tokyo Metropolitan University, Japan; ³Kyushu Institute of Technology, Japan; ⁴Kyushu University, Japan; ⁵Yokohama National University, Japan**16:55-17:15****The effect of synovial fluid composition on CoCrMo wear**Harriet STEVENSON¹, Matthew JAGGARD², Claire BOULANGE³, Pouya AKHBARI², Uddhav VAGHELA, John LINDON³, Horace WILLIAMS², Chinmay GUPTA², Philippa CANN¹¹Imperial College London, Tribology Group, England; ²Imperial College London, Musculoskeletal Laboratory, England; ³Imperial College London, Phenome Center, England**17:15-17:35****Could Ti₆Al₄V be alternative as a bearing surface articulated with polymer in artificial cervical disc?**Song WANG¹, Weiqiang LIU¹¹Research Institute of Tsinghua University in Shenzhen, China; ²Tsinghua University State Key Laboratory of Tribology, China**17:35-17:55****Study on the tribological behaviors of CoCrMo alloy against different materials for use in artificial cervical disc**Dingding XIANG¹, Jian SONG², Song WANG³, Zhenhua LIAO⁴, Weiqiang LIU²¹Tsinghua University State Key Laboratory of Tribology, China; ²Tsinghua University Department of Mechanical Engineering, China; ³Tsinghua University Biomechanics and Biotechnology Lab, China; ⁴Research Institute of Tsinghua University in Shenzhen, China**17:55-18:15****Effect of corrosion on tribology and protein adsorption properties of a CoCrMo alloy used in artificial joints**

Yu YAN, Zhongwei WANG, Lijie QIAO

University of Science and Technology Beijing, China

Room 303**Track5: Tribology in Manufacturing****Metal Forming & Advanced Processing I****Chair: Kun LIU, Hefei University of technology, China****10:10-10:35 Invited****Tribology in rolling technology of steel**

Kiet TIEU

University of Wollongong, Australia

10:35-11:00 Invited**Tribology in multiscale metal forming**

Kuniaki DOHDA

Northwestern University, USA

11:00-11:20**Oxidation and wear mechanics of high speed steel measured by a novel high temperature roller-on-disc testing rig**Hongtao ZHU¹, Qiang ZHU^{1,2}, Guanyu DENG¹, Kiet TIEU¹, Qiong WU³, Qun FAN³¹University of Wollongong, Australia; ²University of New South Wales, Australia; ³Baosteel, China**11:20-11:40****Analysis of hot rolled surface and metallographic structure of SS41 steel lubricated with water-based nano-TiO₂ fluid**

Yanan MENG, Jianlin SUN, Linghui KONG

University of Science & Technology Beijing, China

11:40-12:00**Lubricant film thickness measurements in cold rolling using ultrasound**

Andrew HUNTER

University of Sheffield, United Kingdom

12:00-13:30

Lunch

Room 303**Track5: Tribology in Manufacturing****Metal Forming & Advanced Processing II****Chair: Kuniaki DOHDA, Northwestern University, USA****13:30-13:55 Invited****Direct force measurement in thread rolling operations – experimental and numerical tribological process investigation**

Philipp KRAMER, Peter GROCHE

TU Darmstadt, Germany

13:55-14:20 Invited**Effect of granular matter property on powder compaction**

Kun LIU

Hefei University of Technology, China

14:20-14:40**Wear behavior of friction stir processed NAB alloys in marine environment**Ajay Kumar P.¹, Vishnu NAMBOODIRI², Anirudhan P.², Satish V. KAILAS¹¹Indian Institute of Science (IISc) Bangalore, India; ²Department of Mechanical Engineering, Government Engineering College, India

14:40-15:00

Tribological behaviors of porous metal produced by additive manufacturing from boundary to full film lubrication

Yi ZHU, Guoliang LIN, Xubin CHEN, Jun ZOU, Huayong YANG
Zhejiang University, China

15:00-15:20

Optimal design of the ring with boss compression test for high sensitivity to friction

Chengliang HU, Xiping LIAO, Qiang YIN, Zhen ZHAO
Shanghai Jiaotong University, China

15:30-16:30

Coffee Break & Poster Time

Room 303

Track5: Tribology in Manufacturing Micro and Nano Fabrication

Chair: Guoshun PAN, *Tsinghua University, China*

16:30-16:50

A rotational near-field photolithography system for nanopatterning

Jiaxin JI^{1,2}, Yonggang MENG², Shayu LI³
¹China University of Petroleum, China; ²Tsinghua University, China; ³Chinese Academy of Sciences, China

16:50-17:10

Friction-induced nanofabrication on UV/Ozone treated Si(100) surface

Linmao QIAN, Hongbo WANG, Shulan JIANG, Bingjun YU
Southwest Jiaotong University, China

17:10-17:30

Effects of surface wettability on the defects controlling in soft lithography of ceramic microparts

Junhu MENG¹, Bo SU¹, Lanqing JIAO^{1,2}
¹Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, China;
²University of Chinese Academy of Sciences, China

Room 305E

Track6: Engine and Transmission Tribology Rolling bearings III

Chair: Xiaolan AI, *Timken co., USA*

10:10-10:35 **Invited**

Lubrication problem of retainerless rolling element bearings

Pat Lam Patrick WONG
City University of Hong Kong, Hong Kong

10:35-10:55

Non-steady elastohydrodynamic lubrication for the finite line contact: Subsurface stress analysis

Tobias HULTQVIST, Mohammad SHIRZADEGAN, Aleks VRCEK, Pär MARKLUND, Roland LARSSON, Braham PRAKASH
Luleå University of Technology, Sweden

10:55-11:15

Effect of bearings preload of the tribological performance of elastohydrodynamic conjunctions in the automotive manual transmissions

Angeliki Christina LADEROU, Mahdi MOHAMMADPOUR, Stephanos THEODOSSIADIS, Homer RAHNEJATL
Loughborough University, UK

11:15-11:35

Numerical simulation of the transonic airflow resistance between rings of the high-speed rolling bearing

Hongbin LIU, Gongping LIU, Yunbin LI, Haiyang WANG
Henan University of Science and Technology, China

11:35-11:55

A numerical approach for lubrication analysis in rolling bearing considering real surface morphology

Shi CHEN¹, Zhinan ZHANG¹, Xinsheng WEI²
¹Shanghai Jiao Tong University, China; ²Shanghai Aerospace Control Technology Institute, China

11:55-12:15

Advanced calculations of spherical roller bearings (SRB) accounting for roller skewing

Luc HOUPERT
The Timken Company, France

12:15-13:30

Lunch

Room 305E

Track6: Engine and Transmission Tribology Rolling Bearings IV

Chair: Luc HOUPERT, *Timken co., Europe*

13:30-13:55 **Invited**

Recent achievements in mixed EHL research

Dong ZHU
Sichuan University, China

13:55-14:15

Contact characteristic analysis of thin wall angular contact ball

Ming QIU^{1,2}, Zhenhua NIU¹, Hui DU¹, Xiaoxu PANG¹
¹Henan University of Science and Technology, China; ²Collaborative Innovation Center of Machinery Equipment Advanced Manufacturing of Henan Province, China

14:15-14:35

The theoretical analysis and experimental study for ultra-high speed angular contact ball bearing

Dongfeng WANG, Shengchao LIU, Yanjing YIN
Luoyang Bearing Science & Technology Co., Ltd., China

14:35-14:55

Influence of preload on the friction and wear properties of high-speed instrument rotor angular contact ball bearings

Tao ZHANG, Xiaoyang CHEN
Shanghai University, China

14:55-15:15

Frictional work in oscillating bearings – simulation of an angular contact ball bearing under dry conditions and small amplitudes

Fabian SCHWACK, Felix PRIGGE, Gerhard POLL
Institute of Machine Design and Tribology, Germany

15:15-15:35

Effects of rough surfaces in an angular contact ball bearing

Yunlong WANG, Wenzhong WANG, Zhiqiang ZHAO
Beijing Institute of Technology, China



15:35-16:30

Coffee Break & Poster Time

16:30-16:50

Roller end and flange contact modeling for cylindrical rolling element bearings

Xiaolan AI, Jerry RHODES

*The Timken Company, USA***Room 305E****Track6: Engine and Transmission Tribology****Rolling Bearings V****Chair: Dong ZHU, Sichuan University, USA****16:50-17:10**

Tribological aspects of rolling bearings lubricated with refrigerant

Rudolf HAULEITNER¹, Guillermo E MORALES-ESPEJEL^{2,3}, Magnus ARVIDSSON⁴¹SKF Oesterreich AG; ²SKF Engineering & Research Centre; ³Université de Lyon;⁴SKF Application Competence Centre**17:10-17:30**

Effect of detergent additive and standstill corrosion on rolling contact fatigue

Wen WANG¹, Bo HAN³, Xiaobo ZHOU²¹Shanghai University, China; ²SKF Engineering and Research Centre, China;³SKF Global Technical Centre China, China**17:30-17:50**

NiTi alloys for aerospace bearing applications

Christopher DELLACORTE

*NASA, USA***Room 307****Track6: Engine and Transmission Tribology****Fluid-film BearingsIII****Chair: Federico COLOMBO, Polytechnic University of Turin, Italy****10:10-10:30**

A thermal elastic-hydrodynamic lubricated analysis of highly loaded journal bearings, with varying bulk modulus, to allow high areas of cavitation to be solved

Benjamin ROTHWELL, Seamus GARVEY, John WEBSTER

*University of Nottingham, UK***10:30-10:50**

Running-in of journal bearings subjected to non-stationary conditions

Gero BURGHADT, Georg JACOBS, Florian KOENIG, Christopher SOUS

*RWTH Aachen University, Germany***10:50-11:10**

Static characteristics of a cryogenic hydrostatic journal bearing

Jialei DU, Panyun YAN, Guozhu LIANG

*Beihang University, China***11:10-11:30**

External magnetic field of journal bearing with twined solenoid

Yanjuan ZHANG¹, Jianmei WANG², Decai LI¹¹Beijing Jiaotong University, China; ²Taiyuan University of Science and Technology, China**11:30-11:50**

Load carrying capacity and friction torque in a thrust heterogeneous surface bearing

Evan THOMAS, Romeo GLOVNEA

*University of Sussex, United Kingdom***11:50-13:30**

Lunch

Room 307**Track6: Engine and Transmission Tribology****Fluid-film Bearings IV****Chair: Masaaki MIYATAKE, Tokyo University of Science, Japan****13:30-14:00 Keynote**

Modelling development & technological improvements of hydrodynamic bearings

Michel FILLON

*University of Poitiers, France***14:00-14:20**

A new method for calculating the static performance of hydrostatic journal bearing

Peng LIANG¹, Changhou LU²¹Qingdao University of Technology, China; ²Shandong University, China**14:20-14:40**

Behavior of a two lobe journal bearing with a scratched shaft:

comparison between numerical results and experimental data

Jean BOUYER¹, Célia GIRAUDEAU^{1,2}, Michel FILLON¹, Mathieu HÉLÈNE²,Jérôme BEAURAIN²¹University of Poitiers, France; ²EDF Lab Paris-Saclay, France**14:40-15:00**

Efficient numerical solver of the unsteady thermohydrodynamic Reynolds equation for journal bearings

Silun ZHANG, Mohamed-Amine HASSINI, Mihai ARGHIR

*EDF R&D, France***15:00-15:20**

Ferro-fluid lubrication of finite journal bearings using Jenkins model

Benyebka Bou-Said

*INSA Lyon***15:20-15:40**

Comparison between the load carrying capacity of a Rayleigh step and a heterogeneous slip/non-slip surface bearing

Evan THOMAS¹, Romeo GLOVNEA¹, Kazuyuki YAGI², Joichi SUGIMURA²¹University of Sussex, United Kingdom; ²Kyushu University, Japan**15:40-16:30**

Coffee Break & Poster Time

Room 307**Track6: Engine and Transmission Tribology****Fluid-film Bearings V****Chair: T. V. V. L. N. RAO, The LNM Institute of Information Technology, India****16:30-16:50**

Research on friction vibration of marine water lubricated rubber bearing

Jun YANG, Zhenglin LIU

Wuhan University of Technology, China

16:50-17:10**Equivalent support position and stiffness of misaligned water-lubricated stern tube bearing**Fangrui LV, Chunxiao JIAO, Zhushi RAO, Na TA
*Shanghai Jiao Tong University, China***17:10-17:30****Study on dynamic characteristics of water lubricated bearings fluid-solid coupling system considering local contact**Wu OUYANG^{1,2}, Lei WANG³, Yong JIN^{1,2}, Zhenglin LIU¹, Xinping YAN^{1,4}
¹Wuhan University of Technology, China; ²Key Laboratory of Marine Power Engineering Technology (Ministry of Communications), China; ³China Ship Development and Design Center, China; ⁴National Engineering Research Center for Water Transport Safety, China**17:30-17:50****Static and dynamic characteristics of a self-controlled water-lubricated hydrostatic thrust bearing using an elastic hinge**Koichi JOTAKI, Kazuki FUKUYAMA, Masaaki MIYATAKE, Shigeka YOSHIMOTO
*Tokyo University of Science, Japan***17:50-18:10****Study on the influencing mechanism of water temperature on the lubrication performance of water lubricated rubber pad**Xingxin LIANG¹, Xinping YAN^{1,2}, Wu OUYANG¹, Zhenglin LIU¹, Jian WANG¹
¹Wuhan University of Technology, China; ²National Engineering Research Center for Water Transportation Safety, China**Room 308****Track7: Industrial Tribo-systems****Automotive Tribology I****Chair: Patrick G SWAN**, Aswan Consulting Cc, South Africa**10:10-10:35 Invited****Drastic reduction in drag force of car brake by Rayleigh-step**Takashi NAKAMURA
*Nagoya Institute of Technology, Japan***10:35-10:55****A bottom-up approach to study metal sulphides in brake friction materials at higher temperatures**Christian WOLTER, Thomas GRADT
*Bundesanstalt für Materialforschung und -prüfung (BAM), Germany***10:55-11:15****Brake squeal: Investigating the links between friction mechanisms and dynamic behavior**Edouard DAVIN^{1,2,3}, Anne Lise CRISTOL^{1,2,3}, Yannick DESPLANQUES^{1,2,3}, Jean Francois BRUNEL^{1,3}, Martin DUBOC⁴, Philippe DUFRENOY^{1,3}
¹Laboratoire de mécanique de Lille, France; ²Centrale Lille, France; ³CNRS, France; ⁴Arts et Métiers ParisTech - Lille, France**11:15-11:35****Friction induced noise analysis by potential exciting power method for car components applications**Yan-Ming CHEN¹, David CAZE¹, Moussa DIABY², Catherine GAERTNER², Dominique PIERRAT²
¹CETIM, France; ²PSA, France**11:35-11:55****Characterisation of airborne particles emitted from car brake materials**Oleksii NOSKO¹, Mattia ALEMANI², Ulf OLOFSSON³
¹Bialystok University of Technology, Poland; ²Brembo S.p.A., Italy; ³KTH Royal Institute of Technology, Sweden**11:55-12:15****Synergetic effects inside a simplified friction material: a PCA approach**Florence VIVIER, Diego PELLERÉ
*ITT Italia Srl, China***12:15-12:35****The influence of lubricant composition on shift performance of manual transmissions**Christoph WINCIERZ, Dmitriy SHAKHVOROSTOV, Anatolij SMIRNOV
*Evonik, Germany***12:35-13:30****Lunch****Room 308****Track7: Industrial Tribo-systems****Automotive Tribology II****Chair: Yoshitsugu KIMURA**, The University of Tokyo / Kagawa University, Japan**13:30-13:55 Invited****Contribution of tribology to the progress in industry in Japan - A brief review of the first half century of tribology**Yoshitsugu KIMURA
*The University of Tokyo / Kagawa University, Japan***13:55-14:15****A method of reducing windage power loss of a high-speed motor using a viscous vacuum pump**Junpei HORIIKE, Masaaki MIYATAKE, Shigeka YOSHIMOTO
*Tokyo University of Science, Japan***14:15-14:35****Study of rubber/road dry friction in rolling sliding and linear sliding conditions**Jonas BOUSMAT^{1,2}, Julien SCHEIBERT¹, Alain LE BOT¹, Florian BREMOND²
¹Laboratoire de tribologie et dynamique des systèmes, France; ²Manufacture Michelin, France**14:35-14:55****Experimental investigation on mechanism of tire wear particle production**Haibo HUANG, Jinpeng LIU
*Ningbo University, China***14:55-15:15****Application of DLC coatings for automotive and industrial components in China to minimize friction and wear**Bo WANG, Simon ZHANG
*Ionbond China, China***15:15-15:35****Applications of rotary tribometer with European urban driving cycles**Deepak Halenahally VEEREGOWDA, Angela Maria TORTORA
Ducom Instruments Europe B.V, Netherlands

15:35-16:30

Coffee Break & Poster Time

Room 308

Track7: Industrial Tribo-systems**Space and Aerospace**

Chair: Qian ZOU, Oakland University, USA

16:30-16:50

Research on the characteristics of rolling-tribology with current of space ultra high power transfer rotary joint of unlike structures

Zili LIU¹, Yongzhen ZHANG², Chenfei SONG², Li WANG¹, Xinbin HOU¹¹Qian Xuesen Laboratory of Space Technology, China; ²Henan University of Science and Technology, China

16:50-17:10

Long life technologies of oil-lubricated ball bearing for space applications

Kazuhisa KITAMURA¹, Kazuyoshi YAMAKAWA¹, Akira KOYAMA¹, Kazuaki MANIWA², Takashi NOGI², Shingo OBARA²¹JTEKT Corporation, Japan; ²Japan Aerospace Exploration Agency, Japan

17:10-17:30

Investigations of spatial grease tribological behavior for reformulation

Magali BUSQUET^{1,2}, David LEVEQUE¹, Yves BERTHIER^{1,4}, Mathieu RENOUF^{3,4}, Nathalie BOUSCHARAIN¹, Jacques SICRE⁵¹Université de Lyon, France; ²INS, France; ³Université de Montpellier, France;⁴International Tribology Group, France; ⁵CNES, France

17:30-17:50

Ball screw performance and film formation behavior of four multiply alkylated cyclopentane (MAC) base greases for space applications

Toshifumi MAWATARI¹, Nobuyoshi OHNO¹, Bo ZHANG¹, Akira NAKAJIMA¹, Hiroshi SHIOMI², Shingo OBARA²¹Saga University, Japan; ²Japan Aerospace Exploration Agency, Japan

17:50-18:10

Tribology investigation in open space

Marat BRONOVETS

Institute for Problems in Mechanics of the Russian Academy of Sciences, Russia

Room 311A

Track 8: Tribotest and Monitoring**Condition Monitoring & Data Analysis I**

Chair: Xinping YAN, Wuhan University of Technology, China

10:10-10:40 **Keynote**

How tribology has been helping us to advance and to survive

Gwidon STACHOWIAK

Curtin University, Australia

10:40-11:00

Wear monitoring based on reflected image of a novel on-line visual ferrograph

Bo LI

Xi'an Jiaotong University, China

11:00-11:20

Parameter estimation and residual life prediction for deteriorating lubricating oil based on hidden semi-Markov modeling

Ying DU¹, Tonghai WU¹, Viliam MAKIS²¹Key Laboratory of Education Ministry for Modern Design and Rotor-Bearing System, Canada; ²Department of Mechanical and Industrial Engineering, University of Toronto, Canada

11:20-11:40

Three-dimensional feature extraction of wear particle based on multi-objects tracking and recognition

Shuo WANG, Tonghai WU, Lingfeng YANG, Longxin WANG

Xi'an Jiaotong University, China

11:40-12:00

Directional and multi-scale characterization of curvature of DLC-coated and uncoated surfaces

Marcin WOLSKI¹, Pawel PODSIADLO¹, Gwidon W. STACHOWIAK¹, Kenneth HOLMBERG², Anssi LAUKKANEN², Helena RONKAINEN², Mark GEE³, Nunn John NUNN³, Carsten GACHOT⁴, Lawrence LI⁵¹Curtin University, Australia; ²VTT Technical Research Centre, Finland;³National Physical Laboratory, UK; ⁴Saarland University, Germany; ⁵City University of Hong Kong, Hong Kong

12:00-12:20

Bearing faults in the wind turbine drivetrain: Comparative study of monitoring with FFT and the Discrete Wavelet Transform

Daniel STRÖMBERGSSON, Pär MARKLUND, Kim BERGLUND

Division of Machine Elements, Luleå University of Technology, Luleå, Sweden

12:30-13:30

Lunch

Room 311A

Track 8: Tribotest and Monitoring**Condition Monitoring & Data Analysis II**

Chair: Rob DWYER-JOYCE, University of Sheffield United Kingdom

13:30-14:00 **Keynote**

Remote fault diagnosis system for marine power machinery system based on tribology

Xinping YAN

Wuhan University of Technology, China

14:00-14:20

Vehicular engine oil drain interval evaluation based on on-board diagnostic data

Lei WEI¹, Haitao DUAN¹, Song CHEN¹, Yongliang JIN¹, Bingxue CHENG¹, Dan JIA¹, Jianfang LIU^{1,2}, Jian LI¹¹Wuhan Research Institute of Materials Protection, China; ²Wuhan Polytechnic University, China

14:20-14:40

Online characterization of rolling element bearing wear status using oil debris features

Yeping PENG¹, Tonghai WU¹, Lingfeng YANG¹, Ngaiming KWOK²¹Xi'an Jiaotong University, China; ²The University of New South Wales, Australia

14:40-15:00

A fuzzy clustering-based BP neural network for intelligent wear debris recognition

Tao SHAO, Tonghai WU, Yeping PENG, Shuaiwei GUO
Xi'an Jiaotong University, China

15:00-15:20

The Research of engine oil performance evaluation method based on data mining

Minjie CHEN^{1,2}, Xincong ZHOU¹, Fuming KUANG¹, Kai CHEN¹
¹Wuhan University of Technology, China; ²Guangzhou Mechanical Engineering Research Institute Co., Ltd, China

15:20-16:30

Coffee Break & Poster Time

Room 311A

Track 8: Tribotest and Monitoring

Measurement and Instruments I

Chair: Dan GUO, Tsinghua University, China

16:30-16:55 Invited

Curvature analysis of surface topography at different scales and directions

Paweł PODSIADŁO, Marcin WOLSKI, Gwidon STACHOWIAK
Curtin University, Australia

16:55-17:15

Acoustic emission modelling of three body abrasion in machinery elements

Surojit PODDAR, Naresh TANDON
ITMMEC, Indian Institute of Technology Delhi, India

17:15-17:35

Effects of surface tilt on measurement of friction coefficient by scratch testing

Ming LIU, Chenghui GAO
Fuzhou University, China

17:35-17:55

A novel ultrasonic viscometer to measure PAO viscosity in-situ at high shear rates and pressures suitable for use in EHD problems

Michele SCHIRRU, Rob DWYER-JOYCE
The University of Sheffield, United Kingdom

17:55-18:15

The dynamic measurement of contact pressure distribution in a wheel-rail interface

Henry BRUNSKILL, Roger LEWIS, Rob DWYER-JOYCE
University of Sheffield, United Kingdom

18:15-18:35

Observation of grease behavior in ball bearing using X-ray CT and multi-phase grease simulation

Takashi NODA, Kenichi SHIBASAKI, Shinji MIYATA, Masato TANIGUCHI
NSK Ltd, Japan



Room 201A**Track1: Science of Tribology****Tribochemistry I**Chair: Linmao QIAN, *Southwest Jiaotong University, China***10:10-10:35 Invited**

Tribochemistry at sliding interfaces – shear-induced polymerization of adsorbed molecules upon mechanical shear

Seong H. KIM

*Pennsylvania State University, USA***10:35-10:55**

Tribo-mechano-chemistry: lessons learnt from atomic scale modelling of diamond sliding against silica and silicon

Michael MOSELER, Andreas KLEMENZ, Lars PASTEWKA, Gianpietro MORAS
*Fraunhofer IWM, MicroTribology Centr, Germany***10:55-11:15**

Mechanochemical behaviour of ZDDP

Jie ZHANG, Hugh SPIKES

*Imperial College London, UK***11:15-11:35**

Water-induced mechanochemical reactions and wear of multicomponent silicate glass in humid ambient

Seong H. KIM

*Pennsylvania State University, USA***11:35-11:55**

Effect of interfacial chemical reaction and intermolecular interaction on friction and wear mechanism

Yuliang LI, Wen YUE

*University of Geosciences(Beijing), China***12:00-13:30**

Lunch

Room 201A**Track1: Science of Tribology****Tribochemistry II**Chair: Junhong JIA, *Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, China***13:30-13:55 Invited**

Quantum chemical molecular dynamics simulations on tribochemical reaction dynamics of diamond-like carbon and molybdenum dithiocarbamate

Momoji KUBO, Hiroki MURABAYASHI, Keiko WATASE, Yoshie OHGOSHI, Miho NAKAMURA, Yusuke OOTANI, Yuji HIGUCHI, Nobuki OZAWA, Koshi ADACHI

*Tohoku University, Japan***13:55-14:15**

Influences of surface temperature and applied pressure on cracking of hydrocarbon chains at boundary lubrication: a molecular dynamics approach

Thi Dinh TA, Anh Kiet TIEU, Hongtao ZHU, Ha Manh LE, Huong Thi Thuy TA
*University of Wollongong, Australia***14:15-14:35**

Effect of tribochemical reaction on friction interface structure of amorphous silica under humidity: a molecular dynamics simulation study

Jingxiang XU, Naoki TAKAHASHI, Yusuke OOTANI, Yuji HIGUCHI, Nobuki OZAWA, Momoji KUBO

*Tohoku University, Japan***14:35-14:55**

Tight-binding quantum chemical molecular dynamics simulation study on tribological behaviors of diamond-like carbon against aluminum

Yang WANG, Jingxiang XU, Yusuke OOTANI, Yuji HIGUCHI, Nobuki OZAWA, Koshi ADACHI, Momoji KUBO

*Tohoku University, Japan***14:55-15:15**

First-principles molecular dynamics simulations for tribochemical reactions in silicon based ceramics sliding interface

Yusuke OOTANI, Naoki TAKAHASHI, Momoji KUBO

*Tohoku University, Japan***15:15-16:30**

Coffee Break & Poster Time

Room 201A**Track1: Science of Tribology****Tribochemistry III**Chair: Momoji KUBO, *Tohoku University, Japan***16:30-16:50**

Frictional properties of model boundary films

Wilfred TYSOE¹, Dustin OLSON¹, Hongyu GAO², Chun TANG², Ashlie MARTINI²¹University of Wisconsin-Milwaukee, USA; ²University of California-Merced, USA**16:50-17:10**

The influence of Al-Si alloy on ZDDP tribofilm formation on the counter-surface

Yasunori SHIMIZU^{1,2}, Hugh SPIKES¹¹Imperial College London, UK; ²Idemitsu Kosan Co., Ltd., Japan**17:10-17:30**

Influence of refrigerant-surface chemistry on lubrication conditions

Stephane TROMP¹, Laurent JOLY², Manuel COBIAN³, Nicolas FILLOT¹¹LaMCoS - INSA Lyon, France; ²ILM, France; ³LTDS, France**17:30-17:50**Electrochemical effect on tribofilm formation during running-in process of ZrO₂ ball/52100 steel plate in ZDDP/propylene carbonate solutions

Hui CAO, Yonggang MENG

*Tsinghua University, China***17:50-18:10**

Molecular dynamics analyses for boundary lubrications of carbon-based materials

Hitoshi WASHIZU^{1,2}, Tatsuya MAEDA¹, Hirotoshi AKIYAMA¹, Masakazu KONISHI¹¹University of Hyogo, Japan; ²Kyoto University, Japan

Room 201B
Track1: Science of Tribology
Hydrodynamic and Mixed Lubrication
Chair: Gwidon STACHOWIAK, Curtin University, Australian
10:10-10:30
Multi-scale modelling of the mixed lubrication

Noel BRUNETIERE

University of Poitiers, Ensm
10:30-10:50
Scaling of the dimple influence for parallel surfaces

Marie-Pierre NOUTARY, Nans BIBOULET, Ton LUBRECHT

INSA-Lyon, France
10:50-11:10
Squeeze flow of Bingham fluids through reticulated, compressed foams

Petrica TURTOI¹, Mircea PASCOVICI², Traian CIONE²
¹Military Equipments and Technologies Research Agency, Romania; ²University POLITEHNICA of Bucharest, Romania

11:10-11:30
Transition between mixed lubrication and elastohydrodynamic lubrication with randomly rough surfaces

Julien BONAVENTURE, Juliette CAYER-BARRIOZ, Denis MAZUYER

Ecole Centrale de Lyon, France
11:30-11:50
Investigating lubrication by mapping the evolution of surface topography

Deepak HALENAHALLY VEEREGOWDA, Martijn MIDDELKAMP, Fabio ALEMANNIO

Ducom Instruments Europe B.V, Netherlands
12:00-13:30
Lunch
Room 201B
Track1: Science of Tribology
Elastohydrodynamic Lubrication IV
Chair: Antonius LUBRECHT, INSA-Lyon, France
13:30-13:50
Friction and lubricant flow inside concentrated EHL contact

Petr ŠPERKA, Ivan KRUPKA, Martin HARTL

Brno University of Technology, Czech Republic
13:50-14:10
Numerical analysis of thermohydrodynamic lubrication of the textured rough surfaces with micro-grooves

Jinghu JI, Moyang WANG, Hao FU, Tianyang CHEN, Yonghong FU

Jiangsu University, China
14:10-14:30
Exploring elasto-hydrodynamic lubrication using a finite volume CFD based method

Damon LEE, Daniele DINI, Amir KADIRIC

Imperial College London, UK
14:30-14:50
Towards a new in situ technique for a local measurement of temperature and pressure in elastohydrodynamic contacts using quantum dots

Tarek SEOUDI¹, Sayed ALBAHRANI¹, David PHILIPPON¹, Peter REISS², Jean-Marie BLUET³, Philippe VERGNE¹
¹LaMCos-INSa LYON, France; ²INAC, SPrAM, CEA Grenoble, France; ³INL-INSa Lyon, France

14:50-15:10
Novel approach and new algorithm for the elastic deformation and cavitation in elastohydrodynamic line contacts

Tomasz WOŁOSZYSKI, Paweł PODSIADŁO, Gwidon STACHOWIAK

Curtin University, Australia
15:10-15:30
Exact and general reduced order finite element modeling of elastohydrodynamic lubrication problems

Wassim HABCHI, Jimmy S ISSA

Lebanese American University, Lebanon
15:30-16:30
Coffee Break & Poster Time
Room 201B
Track1: Science of Tribology
Elastohydrodynamic Lubrication V
Chair: Pingyu ZHANG, Henan University, CHINA
16:30-16:50
TEHL simulation and measurements under high sliding conditions

Alexander LIEBEL¹, Milan OMASTA², Petr ŠPERKA², Willy BOIVIN³, Vasilios BAKOLAS¹
¹Schaeffler Technologies AG & Co. KG, Germany; ²Brno University of Technology, Czech Republic; ³SIGMA-Clermont, France

16:50-17:10
Tribo-dynamics of concentrated point contact lubricated with nano-composite grease

Jayant SINGH, Deepak KUMAR, N TANDON

Indian Institute of Technology Delhi, India
17:10-17:30
Investigation of wall slippage by numerical analysis in combination with the test results at high speed

Yaoguang ZHANG, Wenzhong WANG, Ziqiang ZHAO

Beijing Institute of Technology, China
17:30-17:50
Investigation of velocity slip and influences in ball-disc system

Xin ZHAO, Chao WEI, Shihua YUAN

Beijing Institute of Technology, China
Room 201D
Track 2: Wear & Surface Engineering
Wear VI
Chair: Friedrich FRANEK, AC2T Research GmbH, Austria
10:10-10:40 Keynote
On strategies to reduce wear by using functional coatings and surface micro-structures

Dae-Eun KIM

Yonsei University, Korea


10:40-11:00**Characterization of the Low Wear on the Top of Asperities**Alexander KOVALEV¹, Dirk SPALTMAN², Mathias WOYDT², Yonggang MENG¹¹Tsinghua University, China; ²BAM - Federal Institute for Materials Research and Testing, Germany**11:00-11:20****Evolution of surface topography under mixed lubrication condition in running-in process**

Yazhao ZHANG, Yonggang MENG, Nishiura KENSUKE, Hayashi NORIYUKI

Tsinghua University, China; Mitsubishi Heavy Industries, China

11:20-11:40**From use wear traces to prehistoric activities: a multiscale analysis of archaeological surfaces**Haris PROCOPIOU¹, Roberto VARGIOLU², Hassan ZAHOUANI²¹University of Paris, France; ²LTDS- CNRS, France**11:40-12:00****Numerical study on the influence of scratch parameters in single asperity scratch abrasion of steels**

Kannaki PONDICHERRY, Timothy GALLE, Xiaojun XU, Jacob SUKUMARAN,

Dieter FAUCONNIER, Stijn HERTELÉ, Patrick DE BAETS

Ghent University, Belgium

12:00-13:30

Lunch

Room 201D**Track 2: Wear & Surface Engineering****Wear VII****Chair: Nazanin EMAMI, Luleå University of Technology, Sweden****13:30-13:55 Invited****The effect of the interlayer and the composition on the cavitation erosion behavior of DLC films**

Jianhua ZHANG

School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China

13:55-14:15**Alternative approach to simulate an entire particle erosion experiment**

Dirk SPALTMANN, Mathias WOYDT

Bundesanstalt fuer Materialforschung und -pruefung, Germany

14:15-14:35**Application of hard surface coatings for prevention of micro-pitting failure in transmission components**

Nicola DE LAURENTIS, Amir KADIRIC

Imperial College London, United Kingdom

14:35-14:55**Simulation models for predicting the wear process of coated sphere/flat electrical contacts**

Haomiao YUAN, Vitali SCHINOW, Jian SONG

Ostwestfalen-Lippe University of Applied Sciences, Germany

14:55-15:15**Slurry erosion behavior of microwave derived bi-modular composite coatings**

Harpreet Singh GREWAL, Abhishek BABU, Harpreet Singh ARORA

Shiv Nadar University, India

15:15-16:30

Coffee Break & Poster Time

Room 201D**Track 2: Wear & Surface Engineering****Wear VIII****Chair: Yongzhen ZHANG, Henan University of Science and Technology, China****16:30-16:50****Wear analysis of cobalt based alloys in nuclear reactor conditions: a combined experimental and numerical investigation**Ruby MCCARRON¹, David STEWART², Philip SHIPWAY³, Daniele DINI¹¹Imperial College London, United Kingdom; ²Rolls Royce plc, England;³University of Nottingham, England**16:50-17:10****Investigation of micro-wear characteristics of layered coatings**

Kyeong-Hee KANG, Dae-Eun KIM

Yonsei University, Korea

17:10-17:30**Investigation of the temporal development of roughness parameters of real rough surfaces due to wear under mixed-lubricated conditions with the finite-element-method**

Stefan REICHERT, Albert ALBERS, Arn JOERGER

Karlsruher Institute of Technology (KIT), Germany

17:30-17:50**Chemical, morphological and interface stability of Cu-Nb layered nanocomposites subjected to sliding wear**Fuzeng REN^{1,2}, Ekiz ELVAN², Aaron DAHLKE², Pascal BELLON², Robert S.AVERBACK², Nathan MARA³, Irene BEYERLEIN³, M. POURYAZDAN⁴, H. HAHN⁴¹Southern University of Science and Technology, China; ²University of Illinoisat Urbana-Champaign, America; ³Los Alamos National Laboratory, America;⁴Karlsruhe Institute of Technology, Germany**17:50-18:10****Study on anti-loosening performance of nylon inserted nuts**Jianhua LIU¹, Huajiang OUYANG², Zhiqiang FENG³, Zhenbing CAI¹, Minhao ZHU¹¹Southwest Jiaotong University, China; ²University of Liverpool, England;³Université d'Évry-Val d'Essonne, France**Room 203A****Track 2: Wear & Surface Engineering****Coatings VI****Chair: Maria Isabel DE BARROS BOUCHET, Laboratoire de Tribologie et Dynamique des Systèmes, Université de Lyon, France****10:10-10:35 Invited****New evaluation method for elastic and viscoelastic materials and coatings**

Ralph STENGLER

President of Hochschule Darmstadt, Germany



10:35-11:00 Invited**Wear resistance and self-healing superhydrophobic coatings**

Huaiyuan WANG, Zhanjian LIU, Yanji ZHU, Chijia WANG

*Northeast Petroleum University, China***11:00-11:20****Investigation of fracture toughness and sliding properties of CrBC and CrBCN coatings for tribological application**Qianzhi WANG¹, Fei ZHOU¹, Qiang MA¹, Tomas POLCAR², Jiawang YAN³¹Nanjing University of Aeronautics and Astronautics, China; ²University of Southampton, England; ³Keio University, Japan**11:20-11:40****Comparison of tribological properties of lead and lead-free coatings using ring-on-disk test method**

Mayank ANAND, Rizwan BAJWA, Ignacio TUDELA, Rolandas VERBICKAS, Yi ZHANG

*Daido Metal Co. Ltd - European Technical Centre, United Kingdom***11:40-12:00****Comparison of tribological properties of CrN, CrTiN and CrTiBN coatings sliding against SiC and SUS440C balls in water**Fei ZHOU¹, Qiang MA¹, Qianzhi WANG¹, Kangmin CHEN^{1,2}, Zhifeng ZHOU^{1,3}, L.K.Y. LI^{1,3}¹Nanjing University of Aeronautics and Astronautics, China; ²Jiangsu University, China; ³City University of HongKong, China**12:00-12:20****Advanced Diamond Surface Technology – Latest Friction Joints Designed for Forthcoming Generations of Light-Weight-Designs**Willibald SPETH¹, Erhard LEIDICH², Yufeng ZHANG³¹Frictins GmbH, Germany; ²IKAT Technische Universität Chemnitz, Germany;³Frictins Shanghai, China**12:30-13:30****Lunch****Room 203A****Track 2: Wear & Surface Engineering****Coatings VII****Chair: Stephen HSU, George Washington University, United States****13:30-14:00 Keynote****Contact mechanics of coated surfaces**

Izhak ETSION

*Technion-Israel Institute of Technology, Israel***14:00-14:20****Tribological characterization and wear mechanisms of novel nitride and oxynitride PVD coatings designed for applications at high temperatures**Bin ZHANG¹, Jiri NOHAVA¹, Pascal DESSARZIN², Pavla KARVANKOVA², Marcus MORSTEIN²¹Anton Paar TriTec SA, Switzerland; ²PLATIT AG, Switzerland**14:20-14:40****Elevated temperature repetitive micro-scratch testing of hard PVD coatings**Ben BEAKE¹, German FOX-RABINOVICH^{1,2}, Jose ENDRINO^{1,3}¹Micro Materials Ltd, United Kingdom; ²McMaster, Canada; ³Cranfield University, England**14:40-15:00****300 mm class of filtered cathode vacuum arc (FCVA) system for tribological applications**

Jongkuk KIM, Yong-Jin KANG, Young-Jun JANG

*Korea Institute of Materials Science (KIMS), Korea***15:00-15:20****Interaction of EP additives with W- or Mo- based carbide and nitride coatings and their in-situ related formation of a low friction tribofilm**Bernhard KOHLHAUSER¹, Manel RODRÍGUEZ RIPOLL², Helmut RIEDL¹, Carsten GACHOT¹, Paul Heinz MAYRHOFER¹¹TU Wien, Austria; ²AC²T Research GmbH, Austria**15:20-15:40****Influence of chemical bonding of PTFE lubricant to a polyamideimide matrix in antifriction coatings**Michaela GEDAN-SMOLKA¹, Anne MARSCHNER¹, Klaus KUNZE², Rainer FRANKE³, Dieter LEHMANN¹¹Leibniz-Institut fuer Polymerforschung Dresden, Germany; ²Institut fuer Leichtbau und Kunststofftechnik at TU Dresden, Germany; ³Struktur und Werkstoffmechnikforschung at TU Dresden, Germany**15:40-16:30****Coffee Break & Poster Time****Room 203A****Track 2: Wear & Surface Engineering****Coatings VIII****Chair: Ralph STENGLER, Hochschule Darmstadt, Germany****16:30-16:55 Invited****The friction and wear characteristics of graphene coating by the CVD process on piston rings under tribo and engine testing conditions**Hakan KALELI¹, Levent YÜKSEK¹, Emre ÇITAK²¹YILDIZ Technical University, Turkey; ²GrafenBioTech Nano Teknoloji Mühendislik San. ve Tic. Ltd. Şti, Selçuklu/Konya, Turkey**16:55-17:15****Low friction high electrical conductivity of nitrogen-graphene nanocrystalline embedded carbon films**Pengfei WANG¹, Weiqiang ZHANG², Dongfeng DIAO¹¹Shenzhen University, China; ²Xi'an Jiaotong University, China**17:15-17:35****Size dependence of frictional behavior of graphene nanocrystal carbon films by ion irradiation**

Saizhou QIU, Xue FAN, Cheng CHEN, Dongfeng DIAO

*Shenzhen University, China***17:35-17:55****Graphene-based film on steel surfaces in dry sliding and high load conditions for friction and wear reduction**Abdullah ALAZEMI¹, Arthur DYSART¹, Steve SHAFFER², Vilas POL¹, Farshid SADEGHI¹¹Purdue University, United States; ²Bruker Corporation, United States**17:55-18:15****Tribological behavior of Ni/GO nanocomposite coatings**

Hanshan DONG, Shaojun QI, Xiaoying LI

University of Birmingham, United Kingdom

18:15-18:35

Tribological behavior of a self-lubricated GO/WC-12Co composite coating fabricated by detonation gun spraying

Haoliang TIAN

Beijing Institute of Aeronautical Materials, China

Room 203C**Track3: Lubrication and Lubricants****Liquid Lubricants I**

Chair: Masjuki Bin Hassan HAJI HASSAN, University of Malaya, Malaysia

10:10-10:35 Invited

Bubble flow adjacent to surfaces: Shape of a thin lubricating film between a sliding bubble and an inclined plane

Roger HORN, Ninghui HAN, Wren GREENE

Deakin University

10:35-10:55

Development and stability of surfactantless soybean oil in water emulsion with nanoparticles for lubricating purposes

Buyung KOSASIH, Reza TAHERI, Hongtao ZHU, Kiet TIEU

University of Wollongong, Australia

10:55-11:15

In-situ observation of lubricant films in a model rolling element bearing

He LIANG, Amir KADIRIC

Imperial College London, UK

11:15-11:35

Effect of perfluoropolyether (PFPE) concentration on the tribological and mechanical properties of filled SU-8/Talc composite

Jitendra Kumar KATIYAR¹, Sujeet Kumar SINHA², Arvind KUMAR¹

¹Indian Institute of Technology Kanpur, India; ²Indian Institute of Technology Delhi, India

11:35-11:55

Preparing for ILSAC GF-6: advantages of full-synthetic motor oils for boosting fuel economy

Boris ZHMUD, Boris TATIEVSKI

¹BIZOL Lubricants, Germany; ²Applied Nano Surfaces, UK

11:55-12:15

Investigation of inorganic alkali polymer glass as a high temperature lubricant in hot rolling process

Shaogang CUI, Anh Kiet TIEU, Hongtao ZHU, Shanhong WAN

University of Wollongong, Australia

12:30-13:30

Lunch

Room 203C**Track3: Lubrication and Lubricants****Rheology of Lubricants II**

Chair: Wilfred TYSOE, University of Wisconsin-Milwaukee, USA

13:30-13:55 Invited

A new method to solve hydrodynamic lubrication problem of non-newtonian fluid

Ping HUANG¹, Qianqian YANG²

¹South China University of Technology, China; ²Sun Yat-sen University, China

13:55-14:15

Shear thinning and hydrodynamic friction of VM-containing engine oils

Hugh SPIKES¹, Nigel MARX¹, Luis FERNÁNDEZ², Francisco BARCELÓ²

¹Imperial College London, UK; ²Lubricants Group, Repsol Technology Centre, Spain

14:15-14:35

Stretching and shear behaviors of several base lubricants

Jie CHENG¹, Yuzhen ZHAO², Ka MA², Zhanjiang WANG¹, Qian WANG^{1,3}

¹Chongqing University, China; ²Chongqing Branch, Lubricant Co. Ltd. SINOPEC, China; ³Northwestern University, China

14:35-14:55

Origin of shear banding of elastohydrodynamic lubricants

Luca DI MARE, Benedicte GÁLMICHE, Janet WONG

Imperial College London, UK

14:55-15:15

Fluorescence anisotropy as a tool to probe lubricant rheology

Jonathan DENCH¹, Neal MORGAN², Janet WONG¹

¹Imperial College London, UK; ²Shell Global Solutions, UK

15:15-15:35

Interdependency between rheology and tribology of lubricants

Joerg LAEUGER¹, Florian RUMMEL¹, Kartik PONDICHERRY²

¹Anton Paar Germany, Germany; ²Anton Paar GmbH, Austria

15:35-16:30

Coffee Break & Poster Time

Room 203C**Track3: Lubrication and Lubricants****Liquid Lubricants II**

Chair: Roger HORN, Deakin University

16:30-16:55 Invited

Characterization of lubricants by resonance shear measurement

Kazue KURIHARA

Tohoku University, Japan

16:55-17:15

Low friction, lubricity and durability of polymer brushes coatings, characterized thanks to the relaxation tribometer technique

Michel BELIN¹, Hiroyuki ARAFUNE², Toshio KAMIJO², Takaya SATO, Joel PERRET-LIAUDET³

¹CNRS, France; ²Tsuruoka College, Japan; ³Ecole Centrale de Lyon - LTDS, France

17:15-17:35

Tribological behaviors of ceramics in aqueous glycerol solutions

Shuai YAN, Bin LIN, Wenbin HU, Anying WANG, Xiaoxue ZHOU, Xiaofeng ZHANG

Tianjin University, China

17:35-17:55

The tribological behavior of nano carbon materials in aqueous systems

Xiangqiong (Lydia) ZENG, Hongmei, YANG, Jiusheng LI

Shanghai Advanced Research Institute, Chinese Academy of Sciences, China.



17:55-18:15

Water-based lubrication behavior of polyvinyl alcohol on styrene-ethylene-butylene-styrene block copolymers

Qinghua FANG, Feng YE, Xiaoni YANG

Changchun Institute of Applied Chemistry, Chinese Academy of Science, State Key Laboratory of Polymer Physics and Chemistry, China

18:15-18:35

Fuel economy 0W-20 engine oil for natural aspirated small gasoline engine

Daozheng WAN

Castrol (Shenzhen) Co., Limited Shanghai Pudong Branch, China

Room 305A

Track3: Lubrication and Lubricants

Additives VI

Chair: Feng GUO, Qingdao University of Technology, China

10:10-10:30

Supercritical fluid synthesis of gold nanoparticle-decorated graphene and its tribological properties as oil additive

Yuan MENG, Fenghua SU

South China University of Technology, China

10:30-10:50

Influence of lubricant additives on rolling-contact-fatigue of gears: role of sulphur on hydrogen embrittlement

Clotilde MINFRAY¹, Benoit L'HOSTIS¹, Marion FREGONESE², Catherine VERDU², Béatrice VACHER¹, Thierry LE MOGNE¹, Benoit TER OVANESSIAN², Frédéric JARNIAS³, Alder DA-COSTA D'AMBROS³

¹LTDS, France; ²MATEIS, France; ³TOTAL Marketing Services, France

10:50-11:10

Preparation of PEGylated black phosphorus nanoparticles and subsequent application as water-based lubricant additive

Wei WANG, Jianbin LUO, Guoxin XIE

Tsinghua University, China

11:10-11:30

The importance of additive chemistry in generating tribofilms efficient at preventing hydrogen permeation in rolling contacts

Vlad Bogdan NISTE, Hiroyoshi TANAKA, Joichi SUGIMURA

Kyushu University, Japan

11:30-11:50

Novel carbon nanotori additives for lubricants with superior extreme pressure properties

Laura PEÑA-PARÁS¹, Demófilo MALDONADO-CORTÉS¹, Oxana KHARISSOVA², José Santiago CRUZ-BAUELOSL¹, Karla Itzel SALDIVAR¹, Luisana LUISANA¹, Patsy ARQUIETA²

¹Universidad de Monterrey, Mexico; ²Facultad de Ciencias Físico-Matemáticas, Mexico

11:50-12:10

Nanotribology of functionalized silica nanoparticles as water-based lubricant additives

Tianyi SUI, Bin LIN, Shuai YAN

Tianjin University, China

12:10-12:30

Improving drilling efficiency by utilizing sepiolite nanoparticles in drilling fluids

Jamil ABDO, Jan KWAK

Qatar University, Oman

12:30-13:30

Lunch

Room 305A

Track3: Lubrication and Lubricants

Additives VII

Chair: Mark RUTLAND, KTH, Sweden

13:30-13:50

Mechanism of interactions between MoS₂ nanotubes and conventional oil additives under various contact conditions

Agnieszka TOMALA¹, Manel RODRÍGUEZ RIPOLL¹, Maja REMŠKAR², Mitjan KALIN³

¹AC2T research GmbH, Austria; ²Jožef Stefan Institute, Slovenia; ³University of Ljubljana, Slovenia

13:50-14:10

The tribological properties of synthetic magnesium silicate hydroxide as additives in lubricating oil

Bin WANG, Qiuying CHANG, Kai GAO

Beijing Jiaotong University, China

14:10-14:30

Friction-reduction and life-extension effects of two types of new additives on multialkylated cyclopentanes under vacuum condition

Songwei ZHANG, Yi LI, Qi DING, Litian HU

Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, China

14:30-14:50

Investigation of tribological properties of lubricity additives for chlorinated paraffin replacement

Yixing ZHAO(Philip), Alexandra GOODE

Houghton International Inc., USA

14:50-15:10

An investigation on the lubrication mechanism of MoS₂ nanoparticles in unidirectional and reciprocating point contact: the flow pattern effect around the contact area

Hongxing WU, Guangneng DONG

Xi'an Jiaotong University, China

15:10-15:30

The influence of adsorption and tribo-chemistry study of Cu nano-additives in DLC based solid-liquid synergetic system on friction behavior

Yaohui LIU, Yujuan ZHANG, Shengmao ZHANG, Pingyu ZHANG

National & Local Joint Engineering Research Center for Applied Technology of Hybrid Nanomaterials, China

15:30-16:30

Coffee Break & Poster Time



Room 305A**Track3: Lubrication and Lubricants****Additives VIII****Chair: Enrico CIULLI**, *University of Pisa, Italy***16:30-16:50****Impacts of polypropylene glycol (PPG) and pH on tribological properties of water based drilling mud**

Huaping XIAO, Shuhai LIU, Yu CHEN

*China University of Petroleum-Beijing, China***16:50-17:10****Tribological evaluation of Calcium-copper-titanate and Cerium oxide nano-additives in paraffin oil**

Harsha ARAKERE PUTTASWAMY, Gupta RAJEEV NAYAN

*Indian Institute of Technology, Banaras Hindu University, India***17:10-17:30****Towards industry application prospect to develop modified graphene oxide with good oil solubility**Zhilin CHENG^{1,2}, Wei LI¹, Peirong WU¹, Zan LIU¹¹Yangzhou University, China; ²China Aviation Union Graphene Technology Co., Ltd., China**17:30-17:50****Multiple ways to synthesis of thermally reduced graphene additives and reaching high-efficiency lubrication**Jun ZHAO¹, Junyuan MAO¹, Yingru LI², Wei WANG¹, Yongfu WANG³, Yongyong HE¹, Jianbin LUO¹¹Tsinghua University, China; ²China Academy of Engineering Physics, China;³Chinese Academy of Sciences, China**17:50-18:10****Preparation and tribological properties study of CuS nanoparticles as water-based lubricating additives**

Junhua ZHAO, Guangbin YANG, Shengmao ZHANG, Pingyu ZHANG

*National & Local Joint Engineering Research Center for Applied Technology of Hybrid Nanomaterials, China***18:10-18:30****The effect of adding additives in biolubricant on physical and tribological properties**

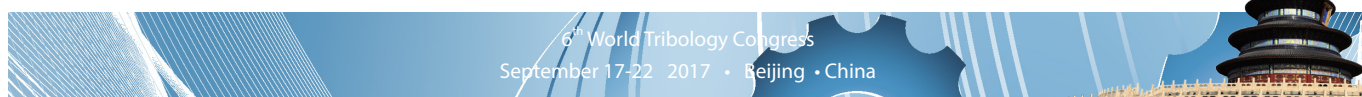
Dedison GASNI, Ismet Hari MULYADI, Jon AFFI

*Andalas University, Indonesia***Room 305C****Track4: Biotribology & Biomimetics****Artificial Joints IV****Chair: Zhongrong ZHOU**, *Tribology Research Institute, Southwest Jiaotong University, Chengdu 610031, China***10:10-10:35 Invited****Contact mechanics and lubrication regime analysis of cervical total disc replacement in conjunction with a multi-body dynamics model of the Human**Hua XIN¹, Hao DIAO¹, Peng LIU², Zhongmin JIN¹¹Xi'an Jiaotong University, China; ²Xi'an Honghui Hospital, China**10:35-10:55****Tribology of surfaces: a study in cartilaginous tissue from synovial joints**

Fausto MOREIRA, Ahmad JABBARZADEH

*The University of Sydney, Australia***10:55-11:15****Observation of lubrication mechanisms within artificial hip joints**David NECAS¹, Martin VRBKA¹, Jiří GALLO², Ivan KRUPKA¹, Martin HART¹¹Brno University of Technology, Czech; ²University Hospital Olomouc, Czech**11:15-11:35****Influence of dehydration by pre-loading on tribological property of hydrogel artificial cartilage and articular cartilage**Seido YARIMITSU¹, Naoya HASHIMOTO¹, Teruo MURAKAMI², Atsushi SUZUKI³, Hiromichi FUJIE¹¹Tokyo Metropolitan University, Japan; ²Teikyo University, Japan; ³Yokohama National University, Japan**11:35-11:55****Tribological properties of graphene oxide sheets as water-based lubricant additives in artificial knee joint**Gangqiang ZHANG¹, Xiangqiong ZENG², Tianhui REN¹, Emile Van der HEIDE³¹Shanghai Jiao Tong University, China; ²Chinese Academy of Sciences, China;³University of Twente, Holand; ⁴TU Delft, Holand**11:55-12:15****Regulation mechanism of biomacromolecules in synovial fluid for superlubricity of Poly (vinylphosphonic acid) (PVPA) coatings on Ti6Al4V**Caixia ZHANG¹, Zhifeng LIU¹, Yuhong LIU², Ligang CAI¹, Shizhu WEN²¹Beijing Key Laboratory of Advanced Manufacturing Technology, China; ²State Key Laboratory of Tribology, Tsinghua University, China**12:30-13:30****Lunch****Room 305C****Track4: Biotribology & Biomimetics****Artificial Joints V****Chair: Zhongmin JIN**, *Xi'an Jiaotong University, China; Xi'an Honghui Hospital, China***13:30-13:50****The effect of insert conformity on wear in total knee replacement**Qida ZHANG¹, Jing ZHANG¹, Zhenxian CHEN¹, Zhongmin JIN¹¹Xi'an Jiaotong University, China; ²University of Leeds, England; ³Southwest Jiaotong University, China**13:50-14:10****A simulator for friction and wear testing of artificial hip joints**Zikai HUA¹, Fei TANG¹, Pingchuan DOU¹, Zhongmin JIN², Xiaojing WANG¹¹Shanghai University, China; ²University of Leeds, England**14:10-14:30****Modelling of the elasto-hydrodynamic lubrication of knee joint replacements with surface topography**Leiming GAO¹, Zikai HUA², Robert HEWSON¹, Michael Skipper Andersen³, Zhongmin JIN^{4,5}¹Imperial College London, England; ²Shanghai University, China; ³Aalborg University, Denmark; ⁴South West Jiaotong University, China; ⁵University of Leeds, England**14:30-14:50****Analyzing the lubrication properties of hydrogel capsule over ceramic-on-ceramic artificial hip joint**

Mahshid HAFEZI, Liguang QIN, Guangneng DONG

Key Laboratory of Education Ministry for Modern Design and Rotor-Bearing System, Theory of Lubrication and Bearing Institute, China

14:50-15:10

Implementing patient-derived multi-activity inputs in a knee joint simulator

Spencer FULLAM¹, Gauthier LOUBRIEU², Diego OROZCO³, Markus WIMMER¹¹Rush University Medical Center, America; ²École centrale de Lyon, France;³ITESM Campus Guadalajara, Mexico

15:30-16:30

Coffee Break & Poster Time

Room 305C

Track4: Biotribology & Biomimetics

Organs&Tissues-I: Tooth

Chair: Jing ZHENG, Tribology Research Institute, Southwest Jiaotong University, China

16:30-17:00 **Keynote**

Bionic design perspectives based on the formation mechanism of dental anti-wear function

Zhongrong ZHOU, Jing ZHENG

Tribology Research Institute, Southwest Jiaotong University, China

17:00-17:20

Effect of hydroxyapatite fibres arrangement on mechanical and microtribological behavior of human tooth enamel

Jing XIA, Lei CHEN, Zhongrong ZHOU, Linmao QIAN

Southwest Jiaotong University, China

17:20-17:40

Effect of acid-attack on the lubrication performance of salivary pellicle on human tooth enamel

Dongwen LIU, Liang ZHENG, Jing ZHENG, Zhongrong ZHOU

Tribology Research Institute, Southwest Jiaotong University, China

17:40-18:00

Tribological effects of different toothpaste additive during tooth brushing on the permanent teeth

Mohamad Ali AHMAD¹, Salmiah KASOLANG¹, Azlina Mimi ABU BAKAR¹, Zakiah MAT RIPEN²¹UNIVERSITI TEKNOLOGI MARA, Malaysia; ²University of Malaya, Malaysia

18:00-18:20

Effects of amelogenin-related amino acids on the remineralization behavior of bovine enamel in CPP-ACP

Liang ZHENG, Wei HAN, Jing ZHENG, Zhongrong ZHOU

Tribology Research Institute, Southwest Jiaotong University, China

Room 303

Track5: Tribology in Manufacturing

CMP and Surface Processing I

Chair: Xinchun LU, Tsinghua University, China

10:10-10:40 **Keynote**

Tribology in chemical-mechanical polishing

Hong LIANG

Texas A&M University, USA

10:40-11:00

Load dependence of frictional forces between single nanoparticles and copper substrate

Yating HUANG¹, Weiqi WANG², Dan GUO², Xinchun LU²¹Beijing Technology and Business University, China; ²Tsinghua University, China

11:00-11:20

Flatness control in the grinding and polishing process of thick silicon reflection mirror

Bocheng JIANG, Dewen ZHAO, Xinchun LU

Tsinghua University, China

11:20-11:40

Defect-free nanofabrication on GaAs surface by tribochemistry material removal

Bingjun YU, Chenning JIN, Xiaoxiao LIU, Linmao QIAN

Southwest Jiaotong University, China

11:40-12:00

A novel catalyst (FeIII-based) and its catalytic performance towards the removal rate of sapphire substrate during CMP process

Li XU, Guoshun PAN, Chunli ZHOU, Yan ZHOU, Guihai LUO

Research Institute of Tsinghua University in Shenzhen, China

12:30-13:30

Lunch

Room 303

Track5: Tribology in Manufacturing

CMP and Surface Processing II

Chair: Hong LIANG, Texas A&M University, USA

13:30-13:55 **Invited**

Research and development of a new CMP tool and its applications

Xinchun LU

Tsinghua University, China

13:55-14:15

CMP behavior of Al₂O₃/SiO₂ core-shell abrasives on sapphire substrate

Xin WANG, Hong LEI, Yue DONG

Shanghai University, China

14:15-14:35

ReaxFF reactive molecular dynamics simulations of Cu chemical mechanical polishing process

Jialin WEN, Tianbao MA, Xinchun LU

Tsinghua University, China

14:35-14:55

The numerical analysis of marangoni drying mechanism in post-CMP cleaning

Changkun LI, Dewen ZHAO, Xinchun LU

Tsinghua University, China

14:55-15:15

Investigation of minimum depth of material removal in nanoscale machining process using molecular dynamics simulations

Pengzhe ZHU, Tianbao MA, Yuanzhong HU, Hui WANG, Jianbin LUO

Tsinghua University, China

15:15-15:35

Mechanochemical surface finishing: process runnability and surface condition monitoring by using angle-resolved light scattering, photothermal analysis and vibration analysis

Boris ZHMUD¹, Jonas LUNDMARK¹, Dietmar SCHORR², Boris BRODMANN³¹Applied Nano Surfaces AB, Sweden; ²Steinbeis Transfer Center Tribology, Karlsruhe, Germany; ³OptoSurf GmbH, Ettlingen, Germany

15:35-16:30

Coffee Break & Poster Time

Room 303**Track5: Tribology in Manufacturing
CMP and Surface Processing III**

Chair: Linmao QIAN, Southwest Jiaotong University, China

16:30-16:50

Nanoparticle impacts on a solid surface in a liquid jet and its effects on the material removal

Xuechu ZHAO, Xuefeng XU

Beijing Forestry University, China

16:50-17:10

Multi-zone pressure control for chemical mechanical planarization system

Hongkai LI, Xinchun LU, Jianbin LUO

Tsinghua University, China

17:10-17:30

Improved fused silica optics surface quality using CMP with colloidal silica

Chunli ZHOU^{1,2,3}, Guoshun PAN^{1,2,3}, Li XU^{1,2,3}, Hua GONG^{1,2,3}, Yan ZHOU^{1,2,3}¹Research Institute of Tsinghua University in Shenzhen, China;²Tsinghua University, China; ³Guangdong Provincial Key Laboratory of

Optomechatronics, China

17:30-17:50

Chemical mechanical polishing (CMP) of SiC wafer utilizing catalyst incorporated pad

Yan ZHOU^{1,2,3}, Guoshun PAN^{1,2,3}, Chunli ZHOU^{1,2,3}, Li XU^{1,2,3}¹Tsinghua University, China; ²Research Institute of Tsinghua Universityin Shenzhen, China; ³Guangdong Provincial Key Laboratory of

Optomechatronics, China

17:50-18:10Synthesis of sm-doped colloidal SiO₂ composite abrasives and their chemical mechanical polishing performances on sapphire substrates

Tingting LIU, Hong LEI, Tianxian WANG

Shanghai University, China

18:10-18:30

Multiscale friction in bio-composite cutting

Mohamed EL MANSORI, Faissal CHEGDANI, Sabeur MEZGHANI

Arts et Métiers ParisTech, France

Room 305E**Track6: Engine and Transmission Tribology
Engine I**

Chair: Victor WONG, Massachusetts Institute of Technology, USA

10:10-10:35 Invited

Tribology in hot steam

Mathias WOYDT¹, Wäsche R¹, Brandt G¹, Yano S², Sasaki S², Ehrke R¹¹Federal Institute for Materials Research and Testing BAM, Germany; ²Tokyo

University of Science (TUS), Tokyo, Japan

10:35-10:55

Advanced piston assembly – liner friction evaluation: simulation and measurement

Ming-Tang MA^{1,2}, Christoph PRIESTNER^{1,2}¹AVL List Technical Center (Shanghai) Co. Ltd, China; ²AVL List GmbH, Austria**10:55-11:15**

A newly developed piston tribo-dynamics model considering deterministic skirt surface grooves

Congcong FANG, Xianghui MENG, Youbai XIE

Shanghai Jiaotong University, China

11:15-11:35

Vibration localization in mechanical models experiencing self-excited vibrations

Antonio PAPANGELO¹, Aurelien GROLET³, Loic SALLES³, NorbertHOFFMANN^{1,3}, Michele CIAVARELLA²¹Hamburg University of Technology, Germany; ²Polytechnic of Bari, Italy;³Imperial College London, UK**11:35-11:55**

Tribology study on turbocharger kinematic parts

Shouxing ZHU¹, Moses ZHAO¹, Marc WILSON², Marek SLOUKA³, MrazekRADIM³, Lionel TOUSSAINT²¹Honeywell integrated technology company, China; ²Honeywell TransportationSystems, TLV, France; ³Honeywell Technology Solution, Czech Republic**11:55-12:15**

Study on the friction reduction between piston and cylinder using floating liner engine

Natsuki KANEKO¹, Hideyuki TABATA¹, Hideyuki IWASAKI¹, Yuji MIHARA¹,Hatsuhiko USAMI³, Tomomi HONDA²¹Tokyo City University, Japan; ²Fukui University, Japan; ³Meijo University, Japan**12:15-13:30**

Lunch

Room 305E**Track6: Engine and Transmission Tribology
Engine II**

Chair: JiuJun XU, Dalian Maritime University, China

13:30-13:50

A numerical model for mechanical interaction of rough surfaces of hydrodynamic tribosystems of piston engines taking into account rheological characteristics of lubricants

Alexei DOIKIN¹, Konstantin GAVRILOV¹, Yurii GORITSKIY², Yuliya ISMAILOVA²¹Federal State Autonomous Educational Institution of Higher Education "SouthUral State University (national research university)", Russia; ²National Research

University "Moscow Power Engineering Institute", Russia

13:50-14:10

Development of tribology simulator using FEM and CFD analyses to predict oil behavior around piston ring

Masayuki OCHIAI, Akihiko AZETSU, Kenji YAMAMOTO, Yuki KAWAMOTO,

Ryuichi SASAKI, Shun TAKAHASHI

Tokai University, Japan



14:10-14:30

Thin film sensors for measuring oil film condition in engine sliding surfaces

Kouta MIURA, Yuji MIHARA
Tokyo City University, Japan**14:30-14:50**

Influence of boundary conditions on starvation of piston ring conjunction

Stephen BEWSHER¹, Mahdi MOHAMMADPOUR¹, Ramin RAHMANI¹, Homer RAHNEJAT¹, Guenter OFFINER²
¹Loughborough University, UK; ²AVL List GmbH, Austria**14:50-15:10**

Mixed lubrication modelling of internal combustion engine connecting-rod bearings

Aurelian FATU
University of Poitiers, France**15:10-16:30**

Coffee Break & Poster Time

Room 305E**Track6: Engine and Transmission Tribology****Engine III****Chair: Mathias WOYDT**, Tokyo University of Science (TUS), Tokyo, Japan**16:30-16:50**

Improving vehicle fuel efficiency through viscosity index improver in engine oils

Frank LAUTERWASSER, Boris EISENBERG, Christoph WINCIERZ
Evonik, Germany**16:50-17:10**

Influence of antiwear and dispersant lubricant additives on soot wear

Hugh SPIKES¹, Artemis KONTOU¹, Mark SOUTHBY², Neal MORGAN²
¹Imperial College London, UK; ²Lubricants Discovery Hub, Shell Global Solutions UK, UK**17:10-17:30**

Tribological and tribochemical characteristics of a lubricated DLC/Cast iron system under sliding and rolling contacts

Yasir ALJEBOORI, Shahriar KOSARIEK, Ardian MORINA, Anee NEVILLE
Leeds University, UK**17:30-17:50**

In-Manufacture running-in of engine components by using the triboconditioning process: synergy with PC-11 and ILSAC GF-6 motor oils

Boris ZHMUD
Applied Nano Surfaces AB, Sweden**Room 307****Track6: Engine and Transmission Tribology****Fluid-film bearings VI****Chair: Wojciech LITWIN**, Gdansk University of Technology, Poland**10:10-10:30**

Study on characteristics of high speed water-lubricated bearings for micro fabrication

Ryosuke MAKINO, Hiroki HOHUKU, Masaaki MIYATAKE, Shigeka YOSHIMOTO
Tokyo University of Science, Japan**10:30-10:50**

Study on a reduction method of power consumption of water lubricated hydrostatic thrust bearings

Yusuke ASAKAWA, Masaaki MIYATAKE, Shigeka YOSHIMOTO
Tokyo University of Science, Japan**10:50-11:10**

Hydrodynamic pressure distribution in water-lubricated hydrodynamic bearings - fluid structure interaction simulations and experimental tests

Artur OLSZEWSKI, Michal WODTKE
Gdansk University of Technology, Poland**11:10-11:30**

The performance analysis of infinite length journal bearing under aqueous solution

Kuankuan LI, Chaohui ZHANG, Jun GU, Zhide LU
Beijing Jiaotong University, China**11:30-11:50**

Surface profile design and its influence on the start-up and shut-down process for tilting-pad thrust bearing under water lubrication

Zhanchao WANG, Ying LIU
Tsinghua University, China**11:50-12:10**

An experimental investigation on a water cooled tilting pad thrust bearing

Farooq NAJAR, G A HARMAN
National Institute of Technology Srinagar, India**12:10-12:30**

Research on water lubricated main shaft bearings in conditions of improper lubrication and cooling conducted on high torque real-life scale bush test rig

Wojciech LITWIN
Gdansk University of Technology, Poland**12:30-13:30**

Lunch

Room 307**Track6: Engine and Transmission Tribology****Sealing I****Chair: Qingbing DONG**, Harbin Engineering University, China**13:30-13:55 Invited**

Towards the development of tribotronic sealing technology

Ian SHERRINGTON, Wilbert SINZARA, Hadley BROOKS, Ahmed ONSY, Edward SMITH
Jost Institute for Tribotechnology, United Kingdom**13:55-14:15**

Fretting wear behavior of thermoplastic polyurethane (TPU) for mechanical seal application

Chao WANG¹, Andreas HAUSBERGER¹, Gerald PINTER², Thomas SCHWARZ³
¹Polymer Competence Center Leoben, Austria; ²University of Leoben, Austria;
³SKF Sealing Solutions Austria GmbH, Austria

14:15-14:35**Cavitation in reverse spiral grooves and leak control in mechanical face seals**Xuezhong MA, Xiangkai MENG, Yuming WANG, Yangyang LIANG, Mingxue SHEN, Xudong PENG
*Zhejiang University of Technology, China***14:35-14:55****Study of mixed lubrication in radial shaft seals with model surface topography**Hiromichi YOSHIMIZU¹, Shigenobu HONDA², Hirotaka MIZUTA², Joichi SUGIMURA¹¹Kyushu University, Japan; ²NOK Corporation**14:55-15:15****Tribological behavior of HNBR in oil and gas field applications**Winoj BALASOORIYA¹, Bernd SCHRITTESSER¹, Chao WANG¹, Andreas HAUSBERGER¹, Gerald PINTER², Thomas SCHWARZ³¹Polymer competence center Leoben GmbH, Austria; ²Montanuniversitaet Leoben, Austria; ³SKF Sealing Solutions Austria GmbH, Austria**15:15-15:35****A coupling hydrodynamic mechanical seal model with considering the gas-liquid phase flow conditions**Guozhong CHEN, Guoyuan ZHANG, Yi ZHANG
*Xidian University, China***15:35-16:30****Coffee Break & Poster Time****Room 307****Track6: Engine and Transmission Tribology**
Sealing II**Chair: Ian SHERRINGTON, Jost Institute for Tribotechnology, United Kingdom****16:30-16:50****Clearance regulation and transient sealing performance analysis of dry gas seal for extreme operating conditions**Yuan CHEN, Xudong PENG, Jinbo JIANG, Jiyun LI
*Zhejiang University of Technology, China***16:50-17:10****An analysis on the stiffness characteristics of spiral groove dry gas seal influenced by the real gas effect at high pressure**Hengjie XU, Pengyun SONG, Wenyuan MAO, Qiangguo DENG
*Kunming University of Science and Technology, China***17:10-17:30****Numerical simulation of the dynamic behavior of a contacting mechanical face seal**Jeremy COCHAIN, Noël BRUNETIÈRE
*Pprime Institute, France***17:30-17:50****Numerical investigation on static and rotordynamic characteristics of convergent-tapered and divergent-tapered hole-pattern damper seals**Dan SUN
*Shenyang Aerospace University, China***17:50-18:10****EHL simulation of the radial shaft sealing system**Stefan THIELEN, Balázs MAGYAR, Bernd SAUER, Flavien FOKO FOKO
*University of Kaiserslautern, Germany***Room 308****Track7: Industrial Tribo-systems****Green Tribology****Chair: Jenfin LIN, National Cheng Kung University, Taiwan, China****10:10-10:40 Keynote****Financial Tribology**Patrick G SWAN
*Aswan Consulting Cc, South Africa***10:40-11:10 Keynote****The challenge in creating sustainable tribological products – 'closing the loop' approach**Satish V. KAILAS
*Indian Institute of Science, India***11:10-11:35 Invited****50 years of tribology: Malaysian perspective**Haji HASSAN, Masjuki Bin HASSAN
*University of Malaya, Malaysia***11:35-12:00 Invited****Oil-water separation based on adjusted surface wettability of filters**Jiadao WANG, Chuan DU, Shuai CHEN, Bao WANG, Hao ZHAO
*State Key Laboratory of Tribology, China***12:00-13:30****Lunch****Room 308****Track7: Industrial Tribo-systems****Railway I****Chair: Georg JACOBS, RWTH Aachen University, Germany****13:30-14:00 Keynote****Dynamic behavior of arc during electrical sliding and its directional erosion**Yongzhen ZHANG
*Henan University of Science and Technology, China***14:00-14:20****A systematic study on the mechanism of friction-induced high-frequency noise**Shuwen WANG, Jie MEI, Linlei ZHOU
*University of Shanghai for Science and Technology, China***14:20-14:40****Hi-tech: cast rails**Leonid SOSNOVSKIY¹, Sergei SHERBAKOV², Guozheng KANG³, Zefeng WEN³, Victor KOMISSAROV⁴
¹S&P Group Tribo-Fatigue Ltd, Belarus; ²Belarusian State University, Belarus;
³Southwest Jiaotong University, China; ⁴Belarusian State University of Transport, Belarus

14:40-15:00

Wheel/rail pair as a tribo-fatigue system and its laboratory models for the tests in the conditions close to operational

Leonid SOSNOVSKIY¹, Sergei SHERBAKOV², Zili LI³, Meysam NAEIMI³

¹S&P Group Tribo-Fatigue Ltd, Belarus; ²Belarusian State University, Belarus;

³Delft University of Technology, Netherlands

15:00-15:20

Damage evolution of AISi7Mg0.6-T6 for catenary under impact-sliding wear

Deqiang TAN¹, Jiliang MO¹, Jinfang PENG¹, Minhao ZHU¹, Jian LUO²

¹Tribology Research Institute, China; ²The Third Railway Survey and Design Institute Group Corporation, China

15:30-16:30

Coffee Break & Poster Time

Room 308

Track7: Industrial Tribo-systems

Railway II

Chair: Satish V. KAILAS, Indian Institute of Science, India

16:30-16:50

On wear and damage transitions of two kinds of railway wheel materials in the rolling-sliding contact

Lubing SHI, Wentao ZHU, Lichang GUO, Qiyue LIU, Wenjian WANG

Tribology Research Institute, Southwest Jiaotong University, China

16:50-17:10

Grease selection for railway axlebox bearings

Muhammad Naqeeb BIN YUSOF¹, Marcel VAN EIJK¹, Marco VAN ZOELLEN², Pieter BAART², Lieuwe DE VRIES²

¹SKF Engineering & Research Centre, Netherlands; ²SKF Global Testing NL, Netherlands

17:10-17:30 Cancelled

Identification of dynamic friction models in a customised sliders-disc system

Xiaocui WANG¹, Jiliang MO¹, Huajiang OUYANG², Yuhang JIANG¹, Minhao ZHU¹, Zhongrong ZHOU¹

¹Southwest Jiaotong University, China; ²University of Liverpool, UK

Room 311A

Track 8: Tribotest and Monitoring

Measurement and Instruments II

Chair: Pawel PODSIADLO, Curtin University, Australia

10:10-10:35 Invited

Research progress on full-mode fretting wear test system

Min-Hao ZHU

Southwest Jiaotong University, China

10:35-10:55

Characterization and model of ionic polymer-graphene composite sensor

Qingsong HE^{1,2}, David VOKOUN³, Min YU¹, Kwang Jin KIM², Dan LI⁴, Zhendong DAI¹

¹Nanjing University of Aeronautics and Astronautics, China; ²University of Nevada Las Vegas, United States; ³Institute of Physics of the Academy of Sciences of the Czech Republic, The Czech Republic; ⁴Monash University, Australia

10:55-11:15

Non-intrusive measurement of lubricant film thickness distribution of thrust bearings

Pan DOU, Tonghai WU, Kai ZHANG

Xi'an Jiaotong University, China

11:15-11:35

Using ultrasound for measuring friction in-situ in contacts

Xiangwei LI, Rob DWYER-JOYCE

The University of Sheffield, United Kingdom

11:35-11:55

A new simple method to investigate variations in electric conductivity of thin-layer coatings

Knut WANTZEN, Constantino PAVLIDES, Albert ALBERS

Karlsruhe Institute of Technology (KIT), Germany

11:55-12:15

Development of a lubricating film thickness and friction force measuring instrument

Dewen ZHAO¹, Xinchun LU¹, Chenhui ZHANG¹, Jianbin LUO¹, Juzhen FENG²

¹Tsinghua University, China; ²Tianjin Hwatsing Technology Company Limited, China

12:30-13:30

Lunch

Room 311A

Track 8: Tribotest and Monitoring

Measurement and Instruments III

Chair: Minhao ZHU, Southwest Jiaotong University, China

13:30-13:55 Invited

Measuring interfaces and lubricants with small shear ultrasonic frequency shear vibrations

Rob DWYER-JOYCE

University of Sheffield, United Kingdom

13:55-14:15

Assessment method for tribological property of ceramic/stainless steel rubbing pairs in hydrogen peroxide solutions

Fuming KUANG, XinCong ZHOU, Jun WANG, Junqiang FANG

Wuhan University of Technology, China

14:15-14:35

Effect of operating conditions and lubricating oils on fuel consumption and CO₂ emissions by real Taxi experiments

Jianfang LIU¹, Lei WEI², Xuzheng QIAN², Jian LI²

¹Wuhan Polytechnic University, China; ²Wuhan Research Institute of Materials Protection, China

14:35-14:55

Research on the relationship between rheological properties and molecular structure

Yong LIANG, Liran MA, Jianbin LUO

Tsinghua University, China

14:55-15:15

New perspectives on micro-abrasion corrosion tests

Jose Daniel BIASOLI DE MELLO, Wilian DA SILVA LABIAPARI, Marcelo BRAGA DOS SANTOS, Henara LILLIAN COSTA

Universidade Federal de Uberlandia, Brazil



15:15-15:35**Bearing fatigue tester with optical module for in situ observation**Martin REPKA¹, Milan OMASTA³, Petr SPERKA³, Colin MCALEESE¹, Motohiko KOSHIMA², Osamu ISHIGO¹¹Daido Metal Co. Ltd. – organizacni slozka, The European Technical Center, Czech Republic; ²Daido Metal Co. Ltd, Japan; ³Brno University of Technology, Czech Republic**15:35-16:30****Coffee Break & Poster Time****Room 311A****Track 8: Tribotest and Monitoring
Measurement and Instruments IV****Chair: Steve SHAFFER, Bruker-TSOM, United States****16:30-16:50****Test method for evaluating tribologically stressed layers on a translatory oscillation tribometer (SRV)**

Gregor PATZER

*Optimol Instruments Prüftechnik GmbH, Germany***16:50-17:10****Full scale test setup for torque and friction measurements of large axial sliding bearings**

Jan DE PAUW, Timothy GALLE, Jonathan VANCOILLIE, Wouter OST, Patrick DE BAETS

*Ghent University, Belgium***17:10-17:30****Development of a specific tribometer for implementation in an environmental-SEM**

Sylvie DESCARTES, Philippe STEYER, David PHILLIPPON, José FERREIRA

*INSA Lyon, France***17:30-17:50****Design of high temperature high pressure water/helium tribometer**

Manish KUMAR, Narendra Mohan DUBE, Anshuman DUBE, Kushal GAUR

*DUCOM Instruments Pvt. Ltd., India***17:50-18:10****Tribology, the materials characterization tool for energy efficient and durable products & process design**

A.Lgartua*, B. Fernández, E. Fuentes, X. Almandoz, R. Bayón, G. Mendoza, X. Fernández, V. Saenz de Viteri, B. Pinedo, B. Zabala, F. Pagano, J. C. Rodríguez, O. Areitioaurtena, I. Martínez de Alcocer, C. Cerrillo, A. López, A. Alberdi, N. Pacios, R. Gómez, P. Cobo, I. Saenz, C. Sanz, A. Arnaiz, J. Laucirica, J. Barriga, F. Egaña, I. Ruiz de Argandoña, A. Gutierrez, E. Aranzabe, J. Terradillos, R. Emparantza, I. Maurtua, J. Mabe and A. Aranzabe

*Fundación TEKNIKER (IK4-TEKNIKER), Spain***18:10-18:30****A comparative study on the micro-abrasive wear behavior of tribological systems submitted to conditions of "constant normal force" and "constant pressure"**

Ronaldo COZZA

*University Center of FEI – Educational Foundation of Ignatius "Padre Saboia de Medeiros", Brazil***Room 203B****Track9: Tribology in Future
Nanotribology****Chair: Carmine PUTIGNANO, Politecnico di Bari, Italy****10:10-10:35 Invited****In-situ analysis for adsorbed additive layer on metal substrate and its nanotribological properties**

Tomoko HIRAYAMA

*Doshisha University, Japan; JST Presto, Japan***10:35-11:00 Invited****Investigation of wear reduction effect by applying compliant nano-structure through molecular dynamics simulation**Hyun-Joon KIM¹, Dae-Eun KIM²¹Kyunpook National University, Korea; ²Yonsei University, Korea**11:00-11:25 Invited****GaN: beyond ultralow wear**Guosong Zeng¹, Xiaofang Yang², Bruce. E. Koel², Nelson Tansu³, Brandon A. Krick¹¹Mechanical Engineering and Mechanics, Lehigh University, USA; ²Princeton University, USA; ³Center for Photonics and Nanoelectronics, Electrical and Computer Engineering, Lehigh University, USA**11:25-11:50 Invited****Investigation of the mechanism of water-based superlubricity**

Chenhui ZHANG, Mingming DENG, Jianbin LUO

*Tsinghua University, China***11:50-12:10****Science education for the future of tribology: new educational material to introduce tribology to young generation**

Alan HASE

*Saitama Institute of Technology, Japan***12:10-13:30****Lunch****Room 203B****Track9: Tribology in Future
Lubrication****Chair: Hyun-Joon KIM, Kyunpook National University, Korea****13:30-13:55 Invited****Lubricant flow in an elastohydrodynamic (EHD) contact**

Janet WONG, Stephen JEFFREYS, Benedicte GALMICHE, Hugh SPIKES

*Imperial College London, UK***13:55-14:20 Invited****Lubrication between viscoelastic solids: theory & experiments**Carmine PUTIGNANO¹, Nigel MARX², Giuseppe CARBONE¹, Daniele DINI², Hugh PIKES²¹Politecnico di Bari, Italy; ²Imperial College, UK**14:20-14:45 Invited****Effects of cylinder liner surface grooves with different angle on tribological properties for cylinder liner-piston**

Chengqing YUAN

Wuhan University of Technology, China

14:45-15:10 Invited

Tribo-condition monitoring for optimized performance and longer service life

Pär MARKLUND

Luleå University of Technology, Sweden

15:10-15:30

The optimization of dimple-arrangement for sealing and lubrication characteristics on mechanical seal surface

Tadatsugu IMURA, Ayano TANISHIMA, Yuta NEGISHI, Yuichiro TOKUNAGA, Hideyuki INOUE

EAGLE INDUSTRY CO., LTD., Japan

15:30-16:30

Coffee Break & Poster Time

Room 203B**Track9: Tribology in Future****Biotribology**

Chair: Chengqing YUAN, Wuhan University of Technology, China

16:30-16:55 Invited

Tribological rehydration of cartilage: new insight into how movement helps keep joints moving

David BURRIS, Axel MOORE, Brian GRAHAM, Chris PRICE

University of Delaware, USA

16:55-17:20 Invited

Mucin growth dynamics on living corneal epithelial cell monolayers

Thomas ANGELINI, Tristan HORMEL, Angela PITENIS, Juan URUEÑA,

Tapomoy BHATTACHARJEE, W. Gregory SAWYER

University of Florida, USA

17:20-17:40

Creation of protein film for low friction by surface texture under sliding contact in blood

Koki KANDA¹, Kenta SUZUKI¹, Shinji KOBAYASHI², Hideki KANEBAKO², Koshi ADACHI¹

¹Tohoku University, Japan; ²Sun Medical Technology Research Corporation, Japan

17:40-18:00

Wormlike sliding motion of water droplets on the superhydrophobic surfaces with nanowire bundles

Yupeng LI, Xiaoyu LI, M. IQBAL, Mingkai LEI

Dalian University of Technology, China



Room 201A**Track1: Science of Tribology****Wear Fundamental I**Chair: Nicholas D SPENCER, *ETH Zurich, Switzerland***10:10-10:40 Keynote**

Relationship between stick-slip sliding and surface damage

Jacob ISRAELACHVILI

*UC Santa Barbara, USA***10:40-11:05 Invited**

Atomic removal mechanism on monocrystalline silicon surface

Linmao QIAN, Chen XIAO, Peng ZHANG, Cheng CHEN, Lei CHEN

*Southwest Jiaotong University, China***11:05-11:25**

Study of anti-wear tribofilm evolution using in-situ synchrotron X-ray measurements

Ardian MORINA, Abdel DORGHAM, Anne NEVILLE

*University of Leeds, UK***11:25-11:45**

Friction between fractal rough surfaces along lubricated point contact

William Woei Fong CHONG¹, Siti Hartini HAMDAN²¹*Universiti Teknologi Malaysia, Malaysia;* ²*University of Southampton Malaysia Campus, Malaysia***11:45-12:05**

Nano-quantum standard of wear

Sergey FEDOROV

*Kaliningrad State Technical University, Russia***12:05-13:30**

Lunch

Room 201A**Track1: Science of Tribology****Wear Fundamental II**Chair: Zhanjiang WANG, *Southwest Jiaotong University, China***13:30-14:00 Keynote**

Science of degradation with application to wear and fatigue

Michael M KHONSARI

*Louisiana State University, USA***14:00-14:20**

Length-scale-dependent fracture behavior of polymeric materials in sliding wear

Li CHANG, Hongjian WANG

*The University of Sydney, Australia***14:20-14:40**

Improved predictive wear models: integration of mechanical properties evolution induced by friction

Tomasz LISKIEWICZ¹, Ben BEAKE², Norbert SCHWARZER³, Nick BIERWISCH³¹*University of Leeds, UK;* ²*Micro Materials Ltd., UK;* ³*Saxonian Institute of Surface Mechanics, Germany***14:40-15:00**

Numerical and experimental investigations of the tungsten carbide wear through impact-sliding conditions

Fridrici VINCENT, Gaetan BOUVARD, Gaylord GUILLONNEAU, Philippe

KAPSA, Marieme FALL

*LTDS, France***15:00-15:50**

Coffee Break

Room 201A**Track1: Science of Tribology****Wear Fundamental III**Chair: Li CHANG, *The University of Sydney, Australia***15:50-16:10**

Mechanical properties and erosion-corrosion behavior of polyetheretherketone (PEEK) /nickel foam co-continuous composites

Xiaoguang YANG^{1,2}, Deli DUAN¹, Shengli JIANG¹, Shu LI¹, Huichen ZHANG²¹*Institute of Metal Research, Chinese Academy of Sciences, China;*²*Transportation Equipment and Ocean Engineering College, China***16:10-16:30**

Fretting wear behavior of the depleted uranium under different atmosphere environment

Zhengyang LI¹, Zhenbing CAI¹, Yanping WU², Wenjin YANG¹, Minhao ZHU¹¹*Southwest Jiaotong University, China;* ²*China Academy of Engineering and Physics, China***16:30-16:50**

Solution of temperature distribution under frictional heating with consideration of inhomogeneous inclusions

Yuanqing LIU, Wenzhong WANG, Shengguang ZHANG

*Beijing Institute of Technology, China***16:50-17:10**

Analysis of two fractal surfaces state in micro sliding process with thermo-mechanical coupling

Lianfeng LAI^{1,2}, Chenghui GAO², Jianmeng HUANG²¹*Ningde Normal University, China;* ²*Fuzhou university, China***17:10-17:30**

Heat conduction with an inhomogeneity due to distributed frictional heating in a half space

Xiujiang SHI^{1,2}, Liqin WANG¹, Qian WANG²¹*Harbin institute of technology, China;* ²*Northwestern University, China***Room 201B****Track1: Science of Tribology****Nanotribology I**Chair: Irina G. GORYACHEVA, *Institute for Problems in Mechanics, Russian Academy of Science, Russia***10:10-10:35 Invited**

Studies of the dynamic tribological properties of 2D nanomaterials

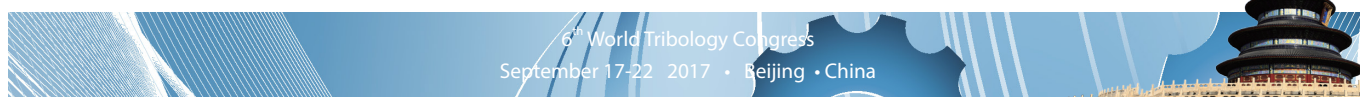
James BATTEAS, Meagan ELINSKI, Zhuotong LIU, Mealani NEGRITO

*Texas A&M University, USA***10:35-10:55**Ultra-low friction interface detection of twisted multilayer MoS₂ based on phonon vibration

Ke JIN, Dameng LIU, Junyi LI

*Tsinghua University, China***10:55-11:15**

Thickness dependent friction on few-layer TMDs

Liang FANG¹, Dameng LIU¹, Yuzheng GUO²¹*Tsinghua University, China;* ²*University of Cambridge, UK*

11:15-11:35

**A combined experimental and DFT study of superlubricity of graphene/
MoS₂ heterostructure**

Linfeng WANG¹, Xiang ZHOU¹, Tianbao MA¹, Dameng LIU¹, Lei GAO¹, Xin LI²,
Yuanzhong HU¹, Hui WANG¹, Yadong DAI³, Jianbin LUO¹

¹Tsinghua University, China; ²Beijing Institute of Technology, China; ³Neotrident
Co., Ltd, China

11:35-11:55

Controllable nanotribological properties of graphene nanosheets

Yitian PENG, Xingzhong ZENG, Haojie LANG

Donghua University, China

11:55-12:15

**Some physical phenomena in nanoscale dissipation and friction from
theory and simulation**

Erio TOSATTI

SISSA, Italy; ICTP, Italy; CNR-IOM Democritos, Italy

12:15-13:30

Lunch

Room 201B

Track1: Science of Tribology

Nanotribology II

Chair: Xianqiang PEI, INM-Leibniz Institute for New Materials, Germany

13:30-13:50

**How does the molecular organization govern the interfacial friction at
nanoscale?**

Alexia CRESPO, Juliette CAYER-BARRIOZ, Denis MAZUYER, Nazario
MORGADO

Ecole Centrale de Lyon, France

13:50-14:10

**Confinement-induced nano-sandwich of liquid crystal in thin film
lubrication**

Liran MA, Ming GAO, Jianbin LUO

Tsinghua University, China

14:10-14:30

**Simultaneous in situ measurements of contact state and friction to
understand the mechanism of lubrication with nanometer-thick liquid
lubricant films**

Hedong ZHANG¹, Yasunaga MITSUYA², Yusuke TAKEUCHI¹, Kenji
FUKUZAWA¹, Shintaro ITOH¹

¹Nagoya University, Japan; ²Nagoya Industrial Science Research Institute,
Japan

14:30-14:50

**Investigation by in situ raman and in situ fluorescence spectroscopies of
the friction reduction mechanisms in sphere plane contacts lubricated
by dispersion of nanoparticles in low viscosity bases**

Jean-Louis MANSOT, Audrey MOLZA, Yves BERCIION

Université des Antilles, France

14:50-15:10

**Interfacial structures and nanotribological behaviors of host-guest
assemblies induced by hydrogen bond and van der Waals force**

Hongyu SHI¹, Yuhong LIU¹, Qingdao ZENG², Chen WANG², Xinchun LU¹

¹Tsinghua University, China; ²National Center for Nanoscience and Technology,
China

15:30-15:50

Coffee Break

Room 201B

Track1: Science of Tribology

Nanotribology III

Chair: Hedong ZHANG, Nagoya University, Japan

15:50-16:10

**Single asperity experiments in understanding macroscopic polymer
tribology**

Xian-Qiang PEI, Roland BENNEWITZ

INM-Leibniz Institute for New Materials, Germany

16:10-16:30

**Molecular origin of frictional behavior of pressure-driven water flow
through graphene nanochannel**

Lei YANG¹, Dongfeng DIAO²

¹Xi'an Jiaotong University, China; ²Shenzhen University, China

16:30-16:50

**Nano-scale Investigation of frictional characteristics of tribo-films in
sliding contacts of representative in-cylinder conditions**

Jamal UMER¹, Nick MORRIS¹, Michael LEIGHTON¹, Ramin RAHMANI¹,
Homer RAHNEJAT¹, Sebastian HOWELL-SMITH², Sashi BALAKRISHNAN³

¹Loughborough University, UK; ²Capricorn Automotive, UK; ³Castrol Technology
Centre, UK

16:50-17:10

Frictional properties of nanojunctions including atomically thin sheets

Wengen QUYANG¹, Ming MA², Quanshui ZHENG², Michael URBACH¹

¹Tel Aviv University, Israel; ²Tsinghua University, China

17:10-17:30 Cancelled

**Effect of groove topography on the contact behavior in EHL and mixed
lubrication.**

Denis MAZUYER¹, Thomas TOUCHE¹, Tomasz WOLOSZYNSKI², Pawel
PODSIADLO², Gwidon STACHOWIAK², Juliette CAYER-BARRIOZ²

¹Ecole Centrale de Lyon, France; ²Curtin University, Australia

17:30-17:50

**Temperature dependency of shear properties of nanometer-thick liquid
lubricant films: a molecular dynamics study**

Takayuki KOBAYASHI, Hedong ZHANG, Kenji FUKUZAWA, Shintaro ITOH

Nagoya University, Japan

17:50-18:10

**Finite element analysis of AFM-cantilever dynamic interactions with
sample**

G BIJU, U B JAYADEEP, M S BOBBI

Indian Institute of Science, India

Room 303

Track1: Science of Tribology

Tribophysics I

Chair: Liran MA, Tsinghua University, China

10:10-10:35 Invited

Material complexity and atomic scale models in tribology

Michael MOSELER

Fraunhofer IWM, Germany



10:35-10:55

Tribo-phase transformation of graphene nanocrystal carbon films studied by in-situ electrical property test

Xue FAN, Saizhou QIU, Dongfeng DIAO

Shenzhen University, China

10:55-11:15

Magnetic field induced ferromagnetic domain evolution and the influence on dry friction behavior: A first principles study

Chao SUN, Yongzhen ZHANG, Sanming DU, Hongbiao HAN

Henan University of Science & Technology, China

11:15-11:35

The relationship between friction coefficient and charge density of PDMS sliding against graphene sheets embedded carbon films

Weiqiang ZHANG¹, Pengfei WANG², Dongfeng DIAO²

¹Xi'an Jiaotong University, China; ²Shenzhen University, China

11:35-11:55

The study of magnetorheological elastomer's friction performance and mechanism with magnetic field

Rui LI, Dejun REN¹, Jiushan LIU¹, Shiwei CHEN², Xiaojie WANG¹

¹Chongqing University of Posts and Telecommunications, China; ²Chongqing Univ. Science & Technology, China

12:00-13:30

Lunch

Room 303

Track1: Science of Tribology

Tribophysics II

Chair: Yuanzhong HU, Tsinghua University, China

13:30-13:55 Invited

From tribology to tribo-fatigue and mechanothermodynamics

LEONID SOSNOVSKIY¹, SERGEI SHERBAKOV²

¹S&P Group Tribo-Fatigue Ltd, Belarus; ²Belarusian State University, Belarus

13:55-14:15

Thermodynamic, tribo-fatigue and mechanothermodynamic entropies

Leonid SOSNOVSKIY¹, Sergei SHERBAKOV², Michael KHONSARI³

¹S&P Group Tribo-Fatigue Ltd, Belarus; ²Belarusian State University, Belarus;

³Louisiana State University, USA

14:15-14:35

Thermodynamic analysis of tribo-fatigue

Michael KHONSARI¹, Mohammad MEHDIZADEH¹, Steven SHAFFER^{1,2}

¹Louisiana State University, USA; ²Bruker Nano Surfaces Division, USA

14:35-14:55

Entropy generation related to heat conduct and plastic deformation in tribology

Zhendong DAI, Yi SONG

Nanjing University of Aeronautics and Astronautics, China

14:55-15:15

Non-equilibrium thermodynamics model and experiments on thin-film lubrication: the role of interfacial interaction

Xiangjun ZHANG, Haoda JING, Yu TIAN, Yonggang MENG

Tsinghua University, China

15:30-15:50

Coffee Break

Room 303

Track1: Science of Tribology

Tribophysics III

Chair: Dongfeng DIAO, Shenzhen University, China

15:50-16:10

Triboemission mechanism and its correlation with tribocharging

Alessandra CINIERO, Tom REDDYHOFF

Imperial College London, UK

16:10-16:30

Collection and Utilization of Triboelectrification Charge

Daoai, WANG, Feng ZHOU, Weimin LIU

Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, China

16:30-16:50

A simple way to modulate the discharging induced by triboelectrification

Na LI¹, Xuefeng XU¹, Liran MA², Jianbin LUO²

¹Beijing Forestry University, China; ²Tsinghua University, China

16:50-17:10

Friction contact affected by surface electron of multi-layer graphene: quantum friction

Xi ZHANG, Dongfeng DIAO

Shenzhen University, China

17:10-17:30

Mechanical states of multielement tribo-Fatigue system

Sergei SHERBAKOV¹, Leonid SOSNOVSKIY²

¹Belarusian State University, Belarus; ²S&P Group Tribo-Fatigue Ltd, Belarus

17:30-17:50

Study on interfacial mechanical properties of diffusion bonding of TiAl alloy and TC11 titanium alloy by nanoindentation test

Haosheng PANG¹, Chenghui GAO¹, Ming LIU¹, Xiaochen WANG², Xuesong FU²

¹Fuzhou University, China; ²Dalian University of Technology, China

17:50-18:10

Triboelectric behavior of Cu rolling electric contact pairs

Chenfei SONG, Yixiang SUN, Yang YUE, Yongzhen ZHANG

Henan University of Science and Technology, China

Room 311A

Track1: Science of Tribology

Contact Mechanics I

Chair: Valentin POPOV, Berlin University of Technology, Institute of Mechanics, Germany

10:10-10:30

In situ measurements of the real area of contact: The contact mechanics challenge

W Gregory SAWYER¹, Alexander BENNETT¹, Kathryn HARRIS¹, Kyle

SCHULZE¹, Juan URUENA¹, Angela PITENIS¹, Martin MUSER², Thomas

ANGELINI¹

¹University of Florida, USA; ²Saarland University, Germany



10:30-10:50**Measurement of the real area of contact using coating technique and SEM**Robert JACKSON, Yang XU, Yan CHEN, Bart PROROK
*Auburn University, USA***10:50-11:10****The effect of velocity on the nominal contact area of elastomeric materials: comparison between theory and experiment**M. Khafidh^{1,2}, N.V. Rodriguez^{1,2}, M.A. Masen³, D.J. Schipper¹¹University of Twente, The Netherlands; ²Dutch Polymer Institute, The Netherlands; ³Imperial College, United Kingdom**11:10-11:30****In-situ measurement of dewetting behavior on rubber-glass interface**

Toshiaki NISHI, Kenta MORIYASU, Tsuyoshi NISHIWAKI

*ASICS Corporation, Japan***11:30-11:50****An in-situ optical study of subsurface crack propagation under sliding herzian contact**

Haiyang ZHANG, Bo TAO, Jia ZENG, Xiaojun LIU, Kun LIU, Jiabin YE

*HeFei University of Technology, China***11:50-12:10****An efficient model for the contact of multiferroic composite materials**Xin ZHANG^{1,2}, Zhanjiang WANG¹, Huoming SHEN¹, Qian WANG^{2,1}¹Southwest Jiaotong University, China; ²Northwestern University, China**12:00-13:30**

Lunch

Room 311A**Track1: Science of Tribology****Contact Mechanics II****Chair: Thomas ANGELINI, University of Florida****13:30-14:00 Keynote****Strength of adhesive contacts: influence of contact geometry and material gradients**

Valentin POPOV

*Berlin University of Technology Institute of Mechanics, Germany***14:00-14:20****Influence of vibration on friction: Critical velocity of controllability**

Mikhail POPOV

*National Research Tomsk Polytechnic University, Russia; Technische Universität Berlin, Germany; National Research Tomsk State University, Russia***14:20-14:40****Modeling elastic adhesive contact for different forms of molecular interaction potential**

Yulia MAKHOVSKAYA

*Ishlinsky Institute for Problems in Mechanics of the Russian Academy of Sciences, Russian***14:40-15:00****A FFT-enhanced boundary element methodology**

Carmine PUTIGNANO, Giuseppe CARBONE

*Politecnico di Bari, Italy***15:00-15:20****Modeling approach for contact simulation of real surfaces on the microscale with composite materials**Daniel NADERMANN¹, Avijit RASTOGI², Hubert SCHWARZE³¹Robert Bosch GmbH - Corporate Sector Research, Germany; ²RWTH Aachen University, Germany; ³Institute of Tribology and Energy Conversion Machinery at Clausthal University, Germany**15:30-15:50**

Coffee Break

Room 311A**Track1: Science of Tribology****Contact Mechanics III****Chair: Tom REDDYHOFF, Imperial College of London, UK****15:50-16:15 Invited****Modeling of sliding contact for viscoelastic layer (3-D model of material)**

Elena TORSKAYA, Feodor STEPANOV

*Ishlinsky Institute for Problems in Mechanics, Russia***16:15-16:35****Contact of curved surfaces in elastic and plastic deformation**

Robert JACKSON

*Auburn University, USA***16:35-16:55****A computational model for evaluating the stressed volume in contact fatigue**

Xiaoqing JIN, Xiangning ZHANG, Pu LI

*Chongqing University, China***16:55-17:15****Effects of truncated tails on pull-off of nominally gaussian self-affine rough surfaces**Antonio PAPANGELO^{1,2}, Michele CIAVARELLA¹, Luciano AFFERRANTE¹¹Polytechnic of Bari, Italy; ²Hamburg University of Technology, Germany**17:15-17:35****Contact pressure distribution during sliding interaction**Vera DEEVA¹, Stepan SLOBODYAN²¹National Research Tomsk Polytechnic University, Russia; ²Omsk State Technical University, Russia**17:35-17:55****Molecular dynamics simulations for the bonding preference of hydrocarbon contaminants in hard disk drives**

Jingan SONG, Changdong YEO

*Texas Tech University, USA***Room 201D****Track 2: Wear & Surface Engineering****Tribo-Materials I****Chair: Junhong JIA, Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, China****10:10-10:35 Invited****Tribological Performance of Cu-Sn Alloys Manufactured by Advanced Master Forming Technologies**Friedrich FRANEK¹, Ulrike CIHAK-BAYR¹, Robin JISA², Andreas PAUSCHITZ¹¹AC2T Research GmbH, Austria; ²Österreichische Tribologische Gesellschaft, Austria

10:35-10:55Friction and wear properties of A356-TiB₂ cast composites fabricated by flux assisted synthesis

Rajnesh TYAGI, Rahul SARASWAT

*Indian Institute of Technology (Banaras Hindu University), India***10:55-11:15**

Friction and wear properties of CrSiCN/SiC tribopairs in water lubrication

Fei ZHOU, Zhiwei WU, Qianzhi WANG

*Nanjing University of Aeronautics and Astronautics, China***11:15-11:35**

Research on preparation and properties of copper-based powder metallurgy brake pads for high-speed train

Tiantian HE, Zhenjun YUAN, Sanming DU, Yongzhen, ZHANG

*Henan University of Science and Technology, China***11:35-11:55**

The mechanisms of strain inducing grain refinement and mixture in worn surface of binary brass

Lin LIU¹, Pujie ZHAN¹, Martin DIENWIEBEL^{2,3}¹Changzhou University, China; ²Karlsruhe Institute for Technology, Germany;³Fraunhofer Institute for Mechanics of Materials, Germany**11:55-12:15**

Microstructure and tribological behavior of in situ Zr-based bulk metallic glass composites

Hong WU, Yanwen TIAN, Han ZENG, Yong LIU

*Central South University, China***12:15-12:35**Fabrication and high-temperature tribological properties of self-lubricating NiCr-SrCrO₄ composites

Jiahu OUYANG, Fan LIU, Zhanguo LIU, Yaming WANG, Yujin WANG

*Harbin Institute of Technology, China***12:35-13:30**

Lunch

Room 201D**Track 2: Wear & Surface Engineering****Tribo-Materials II****Chair: Ming QIU, Henan University of Science and Technology, China****13:30-14:00 Keynote**

Polymer tribology fundamentals and applications

Nikolai MYSHKIN

*Metal-Polymer Research Institute of Belarus National Academy of Sciences, Belarus***14:00-14:20**

High performance hybrid polymer composites for tribological applications

Nazanin EMAMI, A. JAIN

*Luleå University of Technology, Sweden***14:20-14:40**

Preparation of polyimide/UHMWPE blends and their tribological properties in high-speed dry sliding

Song CHEN, Haitao DUAN, Lei WEI, Bingxue CHENG, Jian LI, Kali GU

*Wuhan Research Institute of Materials Protection, China***14:40-15:00**

Clarification of reactive extruding mechanism and tribological behavior on carbodiimide added fiber reinforced PA resin material

Takeshi KUNISHIMA, Takanori KUROKAWA, Hirokazu ARAI

*JTEKT CORPORATION, Japan***15:00-15:20**A comparative study of tribological performance of PEEK composites filled by α -Fe₂O₃ and α -FeOOH nanoparticles under water lubrication conditionsChuanping GAO^{1,2}, Pingyu ZHANG¹, Qihua WANG², Shengmao ZHANG¹, Ga ZHANG²¹Henan University, China; ²State Key Laboratory of Solid Lubrication, Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, China**15:20-15:50**

Coffee Break

Room 201D**Track 2: Wear & Surface Engineering****Tribo-materials III****Chair: Pingping YAO, Central South University, China****15:50-16:15 Invited**

Multiscale design of wear resistant polymer composites

Sergey PANIN¹, B.A. LYUKSHIN^{1,2}, P.A. LYUKSHIN¹, L.A. KORNIENKO¹, S.A.BOCHKAREVAL¹, N.Yu. GRISHAEVA^{1,2}, V.O. ALEXENKO^{1,2}, Nguyen Duc ANH³, Huan QITAO³¹ISPM SB RAS, Russia; ²Tomsk State University of Control Systems and Radioelectronics, Russia; ³National Research Tomsk Polytechnic University, Russia**16:15-16:35**

Effect of hygrothermal aging on wear mechanism and friction behavior of PTFE composites

Nazanin EMAMI, M.R. HOMAYOUN

*Luleå University of Technology, Sweden***16:35-16:55**

Effects of graphene on tribological performance of resin matrix composites

Kaikui ZHENG, Chenghui GAO, Fushan HE, Lei WANG

*Fuzhou University, China***16:55-17:15**

Effect of cenospheres on mechanical properties of epoxy resin composites

Ping CHEN

*University of Science and Technology Beijing, China***17:15-17:35**

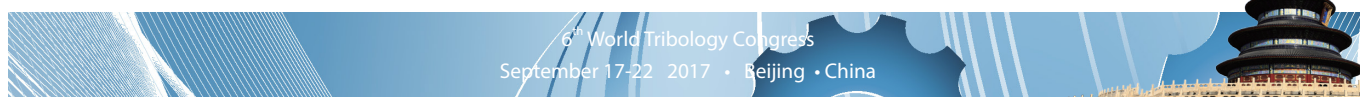
Tribological behavior of carbon filled hybrid UHMWPE composites in water

Hari Shankar VADIVEL, Arash GOLCHIN, Nazanin EMAMI

*Luleå University of technology, Sweden***17:35-17:55**

Impact of metallic counterpart materials on tribofilm formation and tribological mechanisms of polymer composites

Huimin QI, Gen LIU, Ga ZHANG, Tingmei WANG, Qihua WANG

Lanzhou Institute of Chemical Physics, China

17:55-18:15

Silver nanosheet coated copper nanowire/epoxy resin nanocomposites with enhanced electrical conductivity and wear resistance

Ningning ZENG

Henan University, China

Room 203A

Track 2: Wear & Surface Engineering
Coatings IX

Chair: Roman GOLTSBERG, Technion, Israel

10:10-10:30

Sliding wear behavior of thermal sprayed $\text{Al}_2\text{O}_3\text{-Y}_2\text{O}_3$ composite coatings under severe conditions

Jian RONG, Kai YANG

Chinese Academy of Sciences, China

10:30-10:50

Microstructure and properties of TiC/Fe non-skid coating by plasma transferred arc cladding

Deqiang CHEN, Yongzhen ZHANG, Yongping NIU, Bao SHANGGUAN

Henan University of Science and Technology, China

10:50-11:10

Thermal arc spray aluminium coating analysis as a sacrificial anode for cathodic protection

Nor Hayati SAAD, Muhamad Hafiz ABD MALEK, Abdul Rahim M SAHAB

Universiti Teknologi MARA, Malaysia

11:10-11:30

Tribological performances of $\text{Al}_2\text{O}_3/\text{YAG}$ amorphous ceramic coating fabricated by atmospheric plasma spraying

Kai KANG, Jian RONG, Jinxing NI, Yin ZHUANG, Shunyan TAO, Chuanxian DING

Chinese Academy of Sciences, China

11:30-11:50

Effect of Fe content on the microstructure and properties of plasma spraying and remelting NiCrBSi coatings

Jingbai CHEN¹, Lining WAN¹, Yanchun DONG^{1,2}¹Hebei University of Technology, China; ²University of Alberta, Canada

11:50-12:10

Plasma Sprayed Fe-based Amorphous Alloy Superhydrophobic Coating

Xin JIN

China University of Mining and Technology, China

12:20-13:30

Lunch

Room 203A

Track 2: Wear & Surface Engineering
Coatings X

Chair: Ahmet ALPAS, University of Windsor, Canada

13:30-13:50

Structure and tribological properties of multicomponent CrTiAlCN coatings in ambient environment

Fei ZHOU¹, Haotian FANG¹, Qianzhi WANG¹, Kangmin CHEN^{1,2}, Zhifeng ZHOU^{1,3}, L.K.Y LI^{1,3}¹Nanjing University of Aeronautics and Astronautics, China; ²Jiangsu University, China; ³City University of HongKong, China

13:50-14:10

Effects of blade material characteristic on high-speed rubbing behaviour between Al-hBN abradable seal coatings and blades

Weihai XUE, Siyang GAO, Deli DUAN, Peng WANG, Shu LI

Chinese academy of sciences, China

14:10-14:30

Tribological behaviors between aluminum-based seal coatings and titanium boride-coated blades under high-speed rubbing condition

Siyang GAO, Weihai XUE, Deli DUAN, Sihan HOU, Shu LI

Chinese Academy of Sciences, China

14:30-14:50

Effect of Ta addition on the properties of TiAlTaN coating

Hongfei SHANG, Tianmin SHAO

Tsinghua University, China

14:50-15:10

Nano-impact testing to compare the fatigue performance of multilayered coatings

Mayank ANAND¹, Richard COOK², Ignacio TUDELA¹, Rolandas VERBICKAS¹, Yi ZHANG¹¹Daido Metal Co. Ltd - European Technical Centre, United Kingdom; ²National Centre for Advanced Tribology at Southampton (nCATS), England

15:10-15:30

Analysis of three-dimensional thermo-mechanical contact of multilayered materials

Haibo ZHANG, Wenzhong WANG, Ziqiang ZHAO

Beijing Institute of Technology, China

15:30-15:50

Coffee Break

Room 203A

Track 2: Wear & Surface Engineering
Coatings XI

Chair: Wen YUE, China University of Geosciences (Beijing), China

15:50-16:10

Tribocorrosion behavior of Al_2O_3 and $\text{Al}_2\text{O}_3\text{-TiO}_2$ multilayer thin films produced by atomic layer depositionPolyana ALVES RADI^{1,2}, Giorgio ERNESTO TESTONI^{1,2}, Rodrigo SÁVIO PESSOA^{1,2}, Homero SANTIAGO MACIEL^{1,2}, Luis AUGUSTO SOUSA MARQUES DA ROCHA^{3,4}, Lucia VIEIRA^{1,2}¹Instituto Tecnológico de Aeronáutica, Brasil; ²Universidade do vale do Paraíba Brazil; ³UNESP Univ. Estadual Paulista, Brazil; ⁴Centre for Mechanical and Materials Technologies, Portugal

16:10-16:30

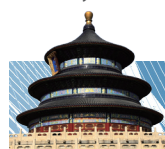
Tribocorrosion behavior of DLC film on metal alloys

Lucia VIEIRA, L.O PAULA, P. A RADI

Instituto Tecnológico de Aeronáutica, Brazil

16:30-16:50

Stress evolution in DLC and Cr monolayer and DLC /Cr multilayer films with variable layer thickness

Junjun WANG^{1,2}, Haoran HE¹, Weijiu HUANG^{1,2}, Linqing WANG¹¹Chongqing University of Technology, China; ²Chongqing Collaborative Innovation Center for Brake Tribological Materials, China

16:50-17:10**Numerical analysis of exponential type hard gradient coating in elastic line contact**Tingjian WANG^{1,2}, Guoen MA², Xinxin MA^{2,3}, Yanshuang WANG¹, Liqin WANG^{2,3}¹Tianjin University of Technology and Education, China; ²AECC Harbin Bearing, China; ³Harbin Institute of Technology, China**17:10-17:30****Molecular dynamics simulation of nanoscratching on different interface Cu/Ni multilayer films**

Rui LI, Teng LIU, Xi LI, Xiang CHEN

Chongqing University of Posts and Telecommunications, China

17:30-17:50**Tribological properties of silver containing at elevated temperatures and wear resistance by laminar coating**

Ameet KUMAR, Jianliang LI

Nanjing University of Science and Technology, China

Room 203C**Track3: Lubrication and Lubricants****Liquid Lubricants-III****Chair: Stephen HSU, George Washington University, USA****10:10-10:40 Keynote****Lubrication next 50 years**

Roland LARSSON

Lulea University of Technology, Sweden

10:40-11:00**Advanced fuel efficient low viscosity lubricants**Stephen HSU¹, Xiangyu GE¹, Gefei WU^{1,2}¹George Washington University, USA; ²Valvoline LLC, USA**11:00-11:20****Measurement of shape of nm-sliding gaps by using ellipsometric microscopy**

Kenji FUKUZAWA, Yusuke SASAO, Shintaro ITOH, Hedong ZHANG

Nagoya University, Japan

11:20-11:40**In situ micro-FTIR spectroscopic observation on shear-induced molecular orientation of carboxylic acids**Renguo LU¹, Shigeyuki MORI², Hiroshi TANI¹, Norio TAGAWA¹, Shinji KOGANEZA WA¹¹Kansai University, Japan; ²Iwate University, Japan**11:40-12:00****Migration of liquid lubricants on a radial grooved surface**Qingwen DAI¹, M. KHONSARI², Wei HUANG¹, Xiaolei WANG¹¹Nanjing University of Aeronautics and Astronautics, China; ²Louisiana State University, USA**12:00-12:20****How to effectively improve the tribological performance of liquid lubricant under space environment: from onefold lubrication to synergistic lubrication**

Xiaoqiang FAN

Southwest Jiaotong University, China

12:20-13:30**Lunch****Room 203C****Track3: Lubrication and Lubricants****Liquid Lubricants IV****Chair: Masabumi MASUKO, Tokyo Institute of Technology, Japan****13:30-14:00 Keynote****Friction Characteristic and Tribofilm Formation of Zinc dialkyldithiophosphate-formulated Lubricating Oils**

Masabumi MASUKO

Tokyo Institute of Technology, Japan

14:00-14:25 Invited**Inkjet based droplet on demand lubrication system for EHL contacts**

C.H. VENNER

University of Twente, Netherland

14:25-14:45**Novel injectable biolubricants mimicking surpamolecular complex effectively restore the lubrication of cartilage by assembling behavior**Renjian XIE¹, Hang YAO^{1,2}, Sa LIU^{1,2}, Li REN^{1,2}, Yingjun WANG^{1,2}, Dongan WANG³¹South China University of Technology; ²National Engineering Research Center for Tissue Restoration and Reconstruction; ³Nanyang Technological University, Singapore**14:45-15:05****Anti-spreading behavior of 1,3-diketone oils for precision lubrication**

Ke LI, Xiping YAN, Deshuang LIU

Wuhan University of Technology, China

15:05-15:25**Lubrication with aqueous solution of polyoxyethylene with castor oil**

Chaohui ZHANG, Kuankuan LI, Jianguo HE, Zhide LU

Beijing Jiaotong University, China

15:30-15:50**Coffee Break****Room 203C****Track3: Lubrication and Lubricants****Grease****Chair: Chenhui ZHANG, Tsinghua University, China****15:50-16:10****The effect of lubricant composition upon film thickness in grease-lubricated EHD contacts subjected to vibrations**

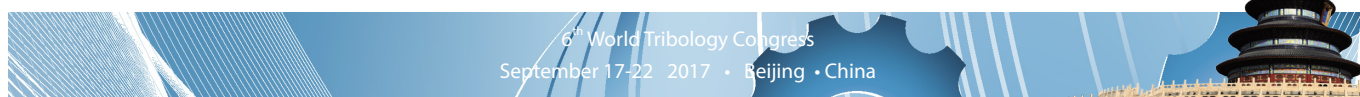
Xingnan ZHANG, Romeo GLOVNEA

University of Sussex, UK

16:10-16:30**The influence of mechanical degradation on grease life**

Hong CHEN, Jianping LIU

Shandong University of Technology, China

16:30-16:50**Grease performance in blade bearings for wind turbine applications – experimental results of scaled tests**Fabian SCHWACK¹, Norbert BADER¹, Fabian HALMOS², Gerhard POLL¹¹Institute of Machine Design and Tribology, Germany; ²IMO GmbH & Co. KG, Germany

16:50-17:10

Behaviour of grease-lubricated EHD contacts under variable loading

Romeo GLOVNEA, Xingnan ZHANG

University of Sussex, UK

17:10-17:30

Experimental study on flow properties of greases with different thickeners

Wataru MORI¹, Joichi SUGIMURA¹, Hiroyoshi TANAKA¹, Kazumi SAKAI², Yuji SHITARA²
¹Kyushu University, Japan; ²JX Nippon Oil & Energy Corporation, Japan

17:30-17:50

Visualization of the grease flow velocity distribution in a rotating bearing using fluorescent particles

Tomohiko HARUYAMA, Naoki SAWADA, Kouta NANRI

Jtekt Corporation, Japan

17:50-18:10

Study into structural impact of novel calcium complex grease delivering high temperature performance

Kazuya WATANABE, Keji TANAKA, Eiji NAGATOMI

Showa Shell Sekiyu K.K., Japan

Room 305A

Track3: Lubrication and Lubricants

Ionic Liquids

Chair: Lei LIU, Southeast University, China

10:10-10:30

Nanotribology study of ionic liquids as lubricant additives for alumina surfaces

Hua LI, Stephen COWIE, Rob ATKIN

University of Newcastle, Australia

10:30-10:50

Study of the tribological properties of in situ synthesized ionic liquids as lubricants additives in mild wear

Shuyan YANG¹, Janet WONG², Feng ZHOU³, Feng GUO¹
¹Qingdao University of Technology, China; ²Imperial College London, UK;

³Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, China

10:50-11:10

Tribotronic control of friction in oil-based lubricants with ionic liquid additives

Peter COOPER¹, Hua LI¹, Mark W RUTLAND², Grant B WEBBER¹, Rob ATKIN¹
¹University of Newcastle, Australia; ²KTH Royal Institute of Technology, Sweden

11:10-11:30

Tribological property of cyano-based ionic liquids under various environment

Shouhei KAWADA¹, Watanabe SEIYA¹, Shinya SASAKI²
¹Graduate School of Tokyo University of Science, Japan; ²Tokyo University of Science, Japan

11:30-11:50

Novel green lubricants: strengthened lignin-amino acid bio-ionic liquids interaction via reciprocal hydrogen bonding

Liwen MU^{1,2}, Jiahua ZHU², Yijun SHI¹
¹Lulea University of Technology, Sweden; ²The university of Akron, USA

11:50-12:10

Ionic liquids from 2-mercaptobenzothiazole: noncorrosive lubricants for steel/bronze contact

Yi LI^{1,2}, Songwei ZHANG¹, Litian HU²
¹Lanzhou Institute of Chemical physics, Chinese Academy of Sciences, China;

²University of Chinese Academy of Sciences, China

12:10-12:30

Solvent-free ionic nanofluids with excellent lubricating performance

Yuxia GUO

Lanzhou Institute of Chemical physics, Chinese academy of sciences, China

12:30-13:30

Lunch

Room 305C

Track4: Biotribology & Biomimetics

Organs & Tissues-II: Skin

Chair: Hongyu ZHANG, Tsinghua University, Chair

10:10-10:40 Keynote

Perception and skin tribology: psychophysics and nanophysics

Mark RUTLAND

Department of Chemistry, Surface and Corrosion Science, Royal Institute of Technology, Sweden

10:40-11:05 Invited

Tribological interaction between the textile fabric and human skin

Hassan ZAHOUANI, Mehdi DJEGHLOUL, Roberto VARGIOLU, Cyril PAILLER-MATTEI

Laboratoire de Tribologie et Dynamique des SYstèmes - Université de Lyon - ENISE - ECL - ENTPE, France

11:05-11:25

Factors affecting friction behavior between laparoscopic grasper and large intestine

Qingyuan YU, Chengmo CAI, Wei LI, Zhongrong ZHOU

Tribology Research Institute, Southwest Jiaotong University, China

11:25-11:45

Skin tribology: the abrasion of calluses

Hassan ZAHOUANI¹, Roberto VARGIOLU¹, Cyril PAILLER-MATTEI¹, Sylvain DELIGNY³
¹University of Lyon, France; ²LTDS- UMR CNRS 5513, France; ³BABYLIS France

11:45-13:30

Lunch

Room 305C

Track4: Biotribology & Biomimetics

Organs & Tissues III

Chair: Hassan ZAHOUANI, Laboratoire de Tribologie et Dynamique des SYstèmes - Université de Lyon - ENISE - ECL - ENTPE, France

13:30-13:50

The Tribology of Hair and its Control

Mark RUTLAND

Department of Chemistry, Surface and Corrosion Science, Royal Institute of Technology, Sweden



13:50-14:10

Study on the frictional performance of surgical needle/suture interacting with soft tissue by using a newly developed penetration friction apparatus (PFA)

Gangqiang ZHANG^{1,2,3}, Tianhui REN³, Walter LELLE², Erik DE VRIES², Xiangqiong ZENG^{1,2}, Emile van der HEIDE^{2,4}

¹Chinese Academy of Sciences, China; ²University of Twente, Holand; ³Shanghai Jiao Tong University, China; ⁴TU Delft, Holand

14:10-14:30

Investigation on the mouth-feel and frictional behavior of typical drinks under the oral environment

Shanhua QIAN, Di WANG

Jiangnan University, China

14:30-14:50

Development of an ex vivo tongue-enamel friction model to mimic dry mouth and to compare saliva substitutes

Jeroen VINKE¹, Hans J. KAPER¹, Arjan VISSINK², Prashant K. SHARMA¹

¹Department of Biomedical Engineering, University of Groningen and University Medical Center Groningen, Holand; ²Department of Oral Maxillofacial Surgery, University of Groningen and University Medical Center Groningen, Holand

14:50-15:10

Applying Tribology to Understand Food Oral Processing

Kartik PONDICHERRY, Charlotte REPPICH, Florian RUMMEL

Anton Paar GmbH, Austria

15:10-15:30

Friction behavior of esophageal internal surface under different liquid mediums

Chengxiong LIN, Wei LI

Tribology Research Institute, Southwest Jiaotong University, China

15:30-15:50

Coffee Break

Room 305C

Track4: Biotribology & Biomimetics

Organs & Tissues IV

Chair: Mark RUTLAND, Department of Chemistry, Surface and Corrosion Science, Royal Institute of Technology, Sweden

15:50-16:10

Study on tactile perception evoked by skin friction

Si CHEN¹, Shirong GE²

¹Jiangsu University, China; ²China University of Mining and Technology, China

16:10-16:30

The friction effects in the stick slip phenomena of the human skin

Andrei TUDOR, Kussay SUBHI, Andrei CALIN, Haider WAHAD, Nicolae STOICA

The Polytechnic University of Bucharest, Romania

16:30-16:50

Development of low friction facial tissue paper

Kei SHIBATA¹, Shohei MATSUMURA¹, Naoki YAMAI¹, Takeshi YAMAGUCHI¹, Hidenori OROZU², Shuta ASUI², Kazuo HOKKIRIGAWA¹

¹Tohoku University, Japan; ²Daio Paper Corporation, Japan

16:50-17:10

Friction behaviour and tactile stimulation: friction and touch and feel of writing

Marc MASEN, Aham ROCHAS

Imperial College London, England

17:10-17:30

Tactile friction of Fischer - Tropsch wax emulsion with liquid crystal structure

Ye WANG

Shanghai Advanced Research Institute, Chinese Academy of Sciences, China

17:30-17:50

Friction characteristics of a finger pad slid on the solid surfaces coated with organic molecular layer with different pattern intervals and width

Yimeng LIU, Rina YANAGISAWA, Saiko AOKI

Tokyo Institute of Technology, Japan

17:50-18:10

Adhesion anisotropy and controllability of attachment between grooved adhesion surfaces

Zheyu LIU, Dashuai TAO, Hongyu LU, Yonggang MENG, Yu TIAN

The State Key Laboratory of Tribology, Tsinghua University, China

Room 305E

Track6: Engine and Transmission Tribology

Engine IV

Chair: Bin ZHAO, Harbin Engineering University

10:10-10:30

Enhanced piston-liner friction reduction through surface texturing

Tom REDDYHOFF, Sorin VLADESCU

Imperial College London, UK

10:30-10:50

Friction control by surface texture in tribosystem with Al-alloy and cast iron in MoDTC oil

Masahiro TAGO, Daiki SUZUKI, Koshi ADACHI

Tohoku University, Japan

10:50-11:10

Cooperative control of friction and oil consumption by combining surface roughness and micro-textures on cylinder bore

Bo XU, Bifeng YIN, Huiqin ZHOU

Jiangsu University, China

11:10-11:30

Impact of honing, engine oil and crankshaft offset on the friction of the piston assembly of a diesel engine

Dirk BARTEL, Matthias SCHORGEL

Otto von Guericke University Magdeburg, Germany

11:30-11:50

The effect tappet geometry on cam tappet durability

Quanbao ZHOU

Changan UK R&D Centre, UK



11:50-12:10

A combined experimental and modelling investigation of laser micro-textured surfaces with focus on piston ring - cylinder liner contacts

Francisco PROFITO^{1,2}, Sorin-Cristian VLĂDESCU², Thomas REDDYHOFF², Daniele DINI²

¹Polytechnic School of the University of São Paulo, Brazil; ²Imperial College London, UK

12:10-13:30

Lunch

Room 305E**Track6: Engine and Transmission Tribology****Engine V**

Chair: Quanbao ZHOU, Changan UK R&D Centre, UK

13:30-13:50

EHL simulation of the timing chain drive

Stefan THIELEN, Balázs MAGYAR, Markus LÖWENSTEIN, Andre BECKER, Bernd SAUER

University of Kaiserslautern, Germany

13:50-14:10

Effect of film strength on roller slip in engine valve train

Riaz MUFTI, Muhammad KHURRAM, Usman BHUTTA, Naqash AFZAL, Usman ABDULLAH, Samiur RAHMAN, Fazal BADSHAH, Zafar RANA

National University of Sciences and Technology, Pakistan

14:10-14:30

Experimental and analytical wear investigations of chain joint wear

Andre BECKER, Bernd SAUER

University of Kaiserslautern, Germany

14:30-14:50

Research trend of engine tribology by Japanese university cooperation

Yuji MIHARA¹, Hatsuhiko USAMI², Masabumi MASUKO³, Kazuyuki YAGI⁴, Masayuki OCHIAI⁵, Yasuhiro DAISHO⁶

¹Tokyo City University, Japan; ²Meijo University, Japan; ³Tokyo Institute of Technology, Japan; ⁴Kyushu University, Japan; ⁵Tokai University, Japan;

⁶Waseda University, Japan

14:50-15:10

Application of big data base and cloud computing in engine component tribology

Chao ZHANG

Shanghai University, China

15:10-15:30

Numerical analysis of the lubrication performance of piston ring-cylinder liner tribo-systems of low speed 2-stroke diesel engine

Tongyang LI, Xiqun LU, Fuzhan HUANG, Xiuyi LV, Shuaiyu ZHOU

Harbin Engineering University, China

15:30-15:50

Coffee Break

Room 305E**Track6: Engine and Transmission Tribology****Gas Bearings**

Chair: Pyung HWANG, Yeungnam University, Korea

15:50-16:10

Balance mechanism and characteristic analysis of the gas thrust bearing for the micro-gravity platform

Yi ZHANG, Guoyuan ZHANG, Guozhong CHEN

Xidian University, China

16:10-16:30

Dynamic model of a gas thrust bearing: experimental tests and numerical model

Colombo FEDERICO

Politecnico di Torino, Italy

16:30-16:50

Modeling of a multi-layer foil gas thrust bearing and its load carrying mechanism study

Jianjun DU, Changlin LI

Harbin Institute of Technology, China

16:50-17:10

Analysis of tilt stiffness and damping coefficients of partial arc annular-thrust aerostatic porous journal bearings

Pyung HWANG¹, Polina V. KHAN²

¹Yeungnam University, South Korea; ²Melentiev Energy Systems Institute, South Korea

17:10-17:30

Static and dynamic characteristics of downsized aerostatic circular thrust bearing with multiple feed holes

Akihito KONDO¹, Masaaki MIYATAKE¹, Shigeka YOSHIMOTO¹, Tadeusz STOLARSKI²

¹Tokyo University of Science, Japan; ²Brunel University London, UK

17:30-17:50

A novel non-contact squeeze film air journal bearing based on near field acoustic levitation

Minghui SHI, Tao GONG, Kai FENG

State Key Laboratory of Advanced Design and Manufacturing for Vehicle Body, China

17:50-18:10

Performance measurement of gas foil bearing with high structural stiffness and damping under varying bearing loads on a rotordynamic test rig

Tao ZHANG, Xueyuan ZHAO, Kai FENG

State Key Laboratory of Advanced Design and Manufacturing for Vehicle Body, China

Room 307**Track6: Engine and Transmission Tribology****Sealing III**

Chair: Jean BOUYER, Institut Pprime, University of Poitiers, France

10:10-10:30

Effect of the circumferential distance between seal fingers on the formation of hydrodynamic film in finger seal

Zengfeng GAO, Tong ZHAO, Yanchao ZHANG, Yahui CUI, Kai LIU

Xi'an University of Technology, China

10:30-10:50

Influence of wall slip effect on leakage rate of hydrodynamic pressure finger seal

Yanchao ZHANG, Pengfei DU, Tong ZHAO, Yahui CUI, Kai LIU

Xi'an University Of Technology, China



10:50-11:10**TEHD analysis of a mechanical seals with tilted surface**

Xiao YANG, Xudong PENG, Xiangkai MENG, Yuming WANG

*Zhejiang University of Technology, China***11:10-11:30****Theoretical and experimental research of steady performance of a through-slot combined groove dry gas seal**

Jinbo JIANG, Cong ZONG, Xudong PENG, Yuan CHEN, Jiyun LI

*Zhejiang University of Technology, China***11:30-11:50****Thermo-elastohydrodynamic lubrication simulation of X-ring hydraulic seals**

Bingqing WANG, Xudong PENG, Xiangkai MENG, Jiyun LI

*Zhejiang University of Technology, China***11:50-12:10****Experimental and theoretical analysis of small diameter brush seals**

Mihai ARGHIR, Lilas DEVILLE

*Université de Poitiers, France***12:10-13:30****Lunch****Room 307****Track6: Engine and Transmission Tribology****Sealing IV****Chair: Dr. Noel BRUNETIERE, Institut Pprime, University of Poitiers, France****13:30-13:50****Experimental study of friction in pneumatic seals**Abdelhak AZZI¹, Abdelghani MAOUI², Didier FRIBOURG², Aurelian FATU¹,Dominique SOUCHET¹¹University of Poitiers, France; ²CETIM Pôle Technologies de l'Étanchéité, France**13:50-14:10****Performance characteristics of viscoseals in laminar flow regime**

Mohamed JARRAY, Dominique SOUCHET, Aurelian FATU

*University of Poitiers, France***14:10-14:30****Effects of subsea operating conditions on mechanical face seal performance**Shifeng WU¹, Ray CLARK¹, Henri AZIBERT²¹A. W. Chesterton Co. USA; ²Fluid Sealing Association, USA**Room 307****Track6: Engine and Transmission Tribology****Tribology Materials I****Chair: Simon TUNG, TUNG Innovation Technology Consulting, Inc.****15:50-16:10****Friction and wear behaviors of the modified nylon self-lubricating rod end spherical plain bearings**Ming QIU^{1,2}, Dawei ZHOU¹, Xia LIANG¹, Xiaoxu PANG¹¹Henan University of Science and Technology China; ²Collaborative Innovation Center of Machinery Equipment Advanced Manufacturing of Henan Province, China**16:10-16:30****Tribological compatibility of some selected Pb-free engine bearing materials with different engine oil formulations**

Daniel Woldegebriel GEBRETSADIK, Jens HARDELL, Brahm PRAKASH

*Luleå University of Technology, Sweden***16:30-16:50****Study on tribological properties of novel biomimetic material for water-lubricated stern tube bearing under the simulated marine environment**

Zhiwei GUO, Chengqing YUAN, Song JIANG, Zongrong YANG

*Wuhan University of Technology, China***16:50-17:10****Development of fluid for chain type CVT**Toshiaki IWAI¹, Mitsugu KUDO¹, Keiichi NARITA¹, Masato OGAWA²¹Idemitsu Kosan, Japan; ²Subaru, Japan**17:10-17:30****Tribological behaviors of porous polyimide containing lubrication oil**Gang ZHOU^{1,2}, Fengbin LIU³, Shaohua ZHANG^{1,2}, Ani ZHANG^{1,2}, TaoZHANG^{1,2}¹Beijing Institute of Control Engineering, China; ²Beijing Key Laboratory of Long-

life Technology of Precise Rotation and Transmission Mechanisms, China;

³North China University of Technology, China**17:30-17:50****Tribological performance of high performance polymers in dry conditions**Janet WONG¹, Annelise JEAN-FULCRAND¹, Marc MASEN¹, Tim BREMNER^{1,2}¹Imperial College London, UK; ²Hoerbiger Corporation of America, Inc., USA**17:50-18:10****Preparation and performances of oil solubility BaSO₄@SiO₂ nanoparticles as additive in oil-based drilling fluid**

Lu CUI, Shengmao ZHANG, Pingyu ZHANG

*Henan University, China***Room 308****Track7: Industrial Tribo-systems****Energy Equipment I****Chair: Yongzhen ZHANG, Henan University Of Science And Technology, China****14:00-14:20****Investigation of grease behavior on the metal seal surface under high pressure gas tight condition by in-situ observations**

Keita INOSE, Masaaki SUGINO, Kunio GOTO

*Nippon Steel & Sumitomo Metal Corporation, Japan***14:20-14:40****Sliding friction behaviors of shale rock-silica contacts under guar gum aqueous solution lubrication in hydraulic fracturing**

Huijie ZHANG, Shuhai LIU, Huaping XIAO

*China University of Petroleum-Beijing, China***14:40-15:00****Friction and wear during wellbore sands cleanout process**

Yanbao GUO, Liu YANG, Deguo WANG, Shuhai LIU

China University of Petroleum, China

15:00-15:20

Evolution of contact between rubber and rigid pipe during experiment of pipe-laying operation

Yongjie ZHOU, Deguo WANG, Yanbao GUO, Shuhai LIU
China University of Petroleum, China

15:20-15:50

Coffee Break

Room 308

Track7: Industrial Tribo-systems
Energy Equipment II

Chair: Wei CHEN, Xi'an Jiaotong University, China

15:50-16:10

Measurement of roller load and lubricant film thickness in a wind turbine high-speed shaft bearing in the field

Gary NICHOLAS, Rob DWYER JOYCE
The University of Sheffield, United Kingdom

16:10-16:30

Cool Tribology: polymer and composites in low temperature sliding

Iestyn STEAD¹, David ECKOLD¹, Henry CLARKE², Daniel FENNELL², Athanasios TSOLAKIS¹, Karl DEARN¹

¹University of Birmingham, United Kingdom; ²Dearman Engine Company, United Kingdom

16:30-16:50

Reproduction of white etching crack under rolling contact loading on thrust bearing and two-disc test rigs

Francisco GUTIERREZ GUZMAN, Georg JACOBS, Gero BURGHARDT
RWTH Aachen University, Germany

16:50-17:10

Flow-induced vibration simulation of steam generator U-tubes based on OpenFOAM

Xiao YE, Run DU, Xiaoyu ZHANG, Pingdi REN
Southwest Jiaotong University, China

Room 305A

Track7: Industrial Tribo-systems
Heavy Machinery I

Chair: Wei PU, Sichuan University, China

13:30-13:50

A combined numerical and experimental investigation of disengaged wet clutch system power loss

Michael LEIGHTON¹, James DAVIES¹, Nicholas MORRIS¹, Gareth TRIMMER², Paul KING¹, Homer RAHNEJAT¹

¹Loughborough University, United Kingdom; ²J. C. Bamford Excavators, United Kingdom

13:50-14:10

Development of analysis method to estimate dynamic characteristics of tilting pad journal bearing

Tomoaki YAMASHITA, Makoto HEMMI
Hitachi, Ltd., Research & Development Group, Japan

14:10-14:30

Measurement of lubrication film thickness of tilting-pad thrust bearing by ultrasonic methods

Kai ZHANG, Pan DOU, Tonghai WU
Xi'an Jiaotong University, China

14:30-14:50

Dynamic analysis of a multi-fulcrum slender shafting

Zhiqiang ZHANG, Liqin WANG, Chuanwei ZHANG
Harbin Institute of Technology, China

14:50-15:10

Research on dynamic frictional contact behavior of friction hoist's liner under different working conditions

Cunao Feng, Dekun ZHANG, Yongbo GUO, Yuan LIU
China University of Mining and Technology, China

15:10-15:30

Experimental study on tribological property of braking mechanism for anti-skid device of friction hoist

Qian WANG¹, Xiaofang XING¹, Xingming XIAO^{1,2}, Chuanhui HUANG¹
¹Xuzhou University of Technology, China; ²China University of Mining and Technology, China

15:30-15:50

Coffee Break

Room 305A

Track7: Industrial Tribo-systems
Heavy Machinery II

Chair: Jiadao WANG, State Key Laboratory of Tribology, China

15:50-16:10

Friction-induced deformation of small caliber projectile during engraving process

Bin WU, Bangjun LIU, Jing ZHENG, Zhiqiang ZOU, Liming HU, Kun JIANG, Xiaolei CHEN, Kaishuan ZHANG, Ronggang CHEN
Army Academy Officer, China

16:10-16:30

Tribological behaviour of coated spur gear pairs with tooth surface roughness

Huaiju LIU¹, Heli LIU¹, Caichao ZHU¹, Ye ZHOU¹, Jinyuan TANG²
¹Chongqing University, China; ²Central South University, China

16:30-16:50

Dynamic internal contact and slip characteristics of bent hoisting rope during lifting

Jun ZHANG, Dagang WANG, Dekun ZHANG, Shirong GE
China University of Mining and Technology, China

16:50-17:10

Dynamic characteristics of mine hoist braking torque during emergency braking in km deep mine

Dagang WANG, Jun ZHANG, Dekun ZHANG, Shirong GE
China University of Mining and Technology, China

17:10-17:30

Viscoelastic behavior of conveyor belts and roller bearings seismic isolators

Nicola MENGHA, Luciano AFFERRANTE, Giuseppe CARBONE, Giuseppe P. DEMELIO
Politecnico di Bari, Italy



17:30-17:50**Sliding friction and wear of liner and grinding ball in iron ore ball mill under different conditions**Yuxing PENG^{1,2}, Xu NI^{1,2}, Zhencai ZHU^{1,2}, Shengyong ZOU^{4,3}, Tongqing LI^{1,2}, Songyong LIU^{1,2}, Lala ZHAO^{1,2}, Jie XU⁵¹China University of Mining and Technology, China; ²China University of Mining and Technology, China; ³Luoyang Mining Machinery Engineering Design Institute Co. Ltd, China; ⁴State Key Laboratory of Mining Heavy Equipment, China; ⁵China University of Mining and Technology, China**Room 203B****Track9: Tribology in future****Wear and Friction Control****Chair: David BURRIS, University of Delaware, USA****10:10-10:35 Invited****Emergence of surface roughness in plastic deformation**

Lars PASTEWKA, Adam HINKLE, Richard JANA

Karlsruhe Institute of Technology

10:35-11:00 Invited**Examples of third body formation in sliding metal surfaces**

Martin DIENWIEBEL

Karlsruhe Institute of Technology, Germany; Fraunhofer Institute for Mechanics of Materials, Germany

11:00-11:20**Measurements of 3D friction forces and of surface potential-controlled friction**Kai KRISTIANSEN¹, Xavier BANQUY², Hongbo ZENG³, Suzanne GIASSEN², Markus VALTINER⁴, Jacob ISRAELACHVILI¹¹University of California Santa Barbara, USA; ²Universite de Montreal, Canada;³University of Alberta, Canada; ⁴Max-Planck-Institut für Eisenforschung, Germany**11:20-11:40****Multi-objective design optimization for zero-leakage and low-friction mechanical seals with surface texturing**Yuichiro TOKUNAGA¹, Hideyuki INOUE¹, Joichi SUGIMURA²¹Kyushu University, Japan; ²Kyushu University, Japan**11:40-12:00****A review on adhesion of wheel/rail interface**

Wenjian WANG, Lubing SHI, Yi ZHU, Qiyue LIU

Zhejiang University, China

12:00-13:30

Lunch

Room 203B**Track9: Tribology in future****Carbon-based Materials****Chair: Lars PASTEWKA, Karlsruhe Institute of Technology****13:30-13:55 Invited****Hard yet tough carbon-based coatings towards high-tech applications**Liping WANG^{1,2}¹Key Laboratory of Marine Materials and Related Technologies, China; ²Key Laboratory of Marine Materials and Protective, China**13:55-14:20 Invited****Wear resistance of graphene: Interior vs. step edge**Qunyang LI¹, Yizhou QI¹, Jun LIU², Quanzhou YAO¹, Ji ZHANG¹, Yalin DONG²¹Tsinghua University, China; ²University of Akron, USA**14:20-14:45 Invited****Enhancement of friction-reducing effects of functionalized polymethacrylate-series polymer additives by combination with DLC coatings under elevated oil temperature condition**

Saiko AOKI, Daiki INOUE

Tokyo institute of technology, Japan

14:45-15:05**Effect of UV/ozone treatment on the tribological properties of carbon microelectromechanical systems structures**

Shulan JIANG, Fangshang ZHONG, Linmao QIAN

Southwest Jiaotong University, China

15:30-15:50

Coffee Break

Room 203B**Track9: Tribology in Future****Tribo-materials****Chair: Yitian PENG, Donghua University, China****15:50-16:10****Effects of moisture, oxygen and temperature on friction mechanism of MoS₂: A molecular dynamics simulation**Nian YIN¹, Zhinan ZHANG¹, Shuaihang PAN², Sulin CHEN¹, Bin SHEN¹¹Shanghai Jiao Tong University, China; ²University of California-Los Angeles, USA**16:10-16:30****Microstructure and wear behavior of functionally graded Al-Si composite prepared by selective laser melting**Nan KANG¹, Zhongming REN², Pierre CODDET¹, Hanlin LIAO¹, Christian CODDET¹¹Université de Bourgogne, France; ²Shanghai University, China**16:30-16:50****Towards understanding of mechanical mixing using multilayer model alloys**

Martin DIENWIEBEL, Ebru CIHAN

Karlsruhe Institute of Technology, Germany

16:50-17:10**Anisotropic flat nanoparticles with different sides sticky/slippy for self forming coatings**

Pavlo RUDENKO

TriboTEX, USA



Room 201A

Track1: Science of Tribology
Superlubricity I

Chair: Jean Miche MARTIN, *Laboratory of Tribology and System Dynamics LTDS, France*

08:30-08:55 **Invited**

Direct measurement of graphite-water interfacial energy

Quanshui ZHENG

Tsinghua University, China

08:55-09:15

Effect of sliding velocity on superlubricity degradation of DLC film

Yunhai LIU¹, Lei CHEN¹, Zhongyue CAO², Bin ZHANG², Junyan ZHANG¹, Linmao QIAN¹

¹Southwest Jiaotong University, China; ²Lanzhou Institute of Chemical Physics, China

09:15-09:35

Tribochemistry and superlubricity of tetrahedral amorphous carbon

Stefan MAKOWSKI¹, Schaller Frank SCHALLER¹, Volker WEIHNACHT¹, Michael BECKER², Andreas LESON¹

¹Fraunhofer Institute for Material and Beam Technology, Germany;

²Fraunhofer USA, Center for Coatings and Diamond Technologies, United States

09:35-09:55

Anisotropy of peeling and superlubricity at graphene-formed interfaces – toward control of atomic-scale real contact area

Naruo SASAKI¹, Takeshi NARTIA¹, Shuya OHMUKI¹, Kouji MIURA²

¹The University of Electro-Communications, Japan; ²Aichi University of Education, Japan

09:55-10:15

Atomic-scale analysis of tribo-induced interfacial nanostructures in superlubric amorphous carbon films

Xinchun CHEN¹, Chenhui ZHANG¹, Takahisa KATO², Xin-an YANG³, Sudong WU⁴, Rong WANG¹, Masataka NOSAKA², Jianbin LUO¹

¹Tsinghua University, China; ²The University of Tokyo, Japan; ³Institute of Physics, Chinese Academy of Sciences, China; ⁴Ningbo Institute of Materials Technology and Engineering, Chinese Academy of Sciences, China

10:15-10:35

Coffee Break

Room 201A

Track1: Science of Tribology
Superlubricity II

Chair: Quanshui ZHENG, *Tsinghua University, China*

10:35-10:55

New insight into origin of macro-superlubricity of polyethylenimine / molybdenum disulphide films in dry environments

Prabakaran SARAVANAN, Joichi SUGIMURA, Tanaka HOROYOSHI

International Institute for Carbon-Neutral Energy Research (I2CNER), Japan

10:55-11:15

Superlubricity of segregated polymer brushes in water

Troels RON, Seunghwan LEE, Irakli JAVAKHISHVILI

Technical University of Denmark, Denmark

11:15-11:35

The effect of contact area on the ultra-low friction between the carbon nanotube and substrate

Kai ZHANG, Ming MA, Yingying ZHANG, Wen WANG, Songlin SHI, Quanshui ZHENG

Tsinghua University, China

12:00-13:30

Lunch

Room 201A

Track1: Science of Tribology
Superlubricity III

Chair: Tianbao MA, *Tsinghua University, China*

13:30-13:55 **Invited**

Impact of superlubricity on the Stribeck curve

Jean Miche MARTIN¹, Qunfeng ZENG², Maria Isabel DE BARROS BOUCHET¹, Makoto KANO³

¹Laboratory of Tribology and System Dynamics LTDS, France; ²Xi'an Jiaotong University, China; ³Kanagawa Industrial Technology center, Japan

13:55-14:15

Superlubricity achieved by aqueous hydroxyethyl cellulose in surface contact

Huichen ZHANG, Dezun SHENG, Xuelian QI

Dalian Maritime University, China

14:15-14:35

Ultralow friction of steel surfaces induced by a tribochemical running-in process using 1,3-Diketone lubricants

Shumin ZHANG¹, Ke LI^{2,3}, Deshuang LIU^{2,3}, Chenhui ZHANG¹, Xinping YAN^{2,3}, Jianbin LUO¹

¹State Key Laboratory of Tribology, China; ²National Engineering Research Center for Water Transport Safety, China; ³Intelligent Transport Systems Research Center, China

14:35-14:55

AFM studies on the liquid superlubricity between silica surfaces achieved with surfactant micelles

Jinjin LI

State Key Laboratory of Tribology, China

14:55-15:15

Graphene nanoribbons and polymeric chains sliding on Au(111)

Ernst MEYER¹, Remy PAWLAK¹, Sara FREUND¹, Urs GYSIN¹, Thilo GLATZEL¹, Alexis BARATOFF¹, Res JOEHR¹, Shigeki KAWAI²

¹University of Basel, Switzerland; ²National Institute for Material Science (NIMS), Japan

15:15-15:35

Critical length limiting superlow friction

Ming MA¹, Andrea BENASSI², Andrea VANOSSO^{3,4}, Michael URBACH⁵

¹Tsinghua University, China; ²Empa, Swiss Federal Laboratories for Materials Science and Technology, Switzerland; ³CNR-IOM Democritos National Simulation Center, Italy; ⁴International School for Advanced Studies (SISSA), Italy; ⁵Tel Aviv University, Israel



Room 201B**Track1: Science of Tribology****Nanotribology IV**Chair: Ming MA, *Tsinghua University, China***8:30-8:50**

Single asperity sliding: a multi-scale coupling analysis between discrete dislocation plasticity and crystal plasticity finite element method

Yilun XU, Diniele DINI, Daniel BALINT

*Imperial College London, UK***8:50-9:10**

Numerical simulation of shearing liquid bridge

Kentaro TANAKA, Katsumi IWAMOTO

*Tokyo University of Marine Science and Technology, Japan***9:10-9:30**

Exploring nano-scale friction involving textured surfaces via molecular dynamics simulations

Hualong YU¹, Xia HU², Chengjiao YU³, Qian WANG⁴¹China University of Petroleum-Beijing at Karamay, China; ²KaramayVocational and Technical College, China; ³Baker Hughes Inc, US;⁴Northwestern University, China**Room 311A****Track1: Science of Tribology****Contact Mechanics IV**Chair: Patrick WONG, *City University of Hong Kong, China***8:30-8:50**

Coating-substrate system with imperfect bonding interface: coupled dislocation-like and force-like conditions

Zhanjiang WANG¹, Hao YU², Qian WANG^{3,1}¹Southwest Jiaotong University, China; ²Chongqing University, China;³Northwestern University, China**8:50-9:10**

Elasto-plastic contact of materials containing double-layered inhomogeneities

Mengqi ZHANG^{1,2}, Ning ZHAO¹, Qinghua ZHOU³, Zhanjiang WANG⁴,
Xiaoqing JIN⁴, Leon KEER², Peter GLAWS⁵, Phil HEGEDUS⁵, Qian WANG²¹Northwestern Polytechnical University, China; ²Northwestern University, China; ³Sichuan University, China; ⁴Chongqing University, China; ⁵TimkenSteel, USA**9:10-9:30**

An explicit matrix solution for a three-dimensional elastic wedge under surface loadings

Wen WANG¹, Zhiming ZHANG¹, Liang GUO², Patrick WONG²¹Shanghai University, China; ²City University of Hong Kong, Hong Kong, China**9:30-9:50**

A numerical contact solver for adhesive contact between viscoelastic materials

Hualong YU¹, Xia HU², Qian WANG³¹China University of Petroleum-Beijing at Karamay, China; ²KaramayVocational and Technical College, China; ³Northwestern University, China**10:10-10:30**

Coffee Break

Room 311A**Track1: Science of Tribology****Contact Mechanics V**Chair: Robert JACKSON, *Auburn University, USA***10:30-10:50**

Contact formation on soft patterned substrates: scale similarities in wetting and adhesion behaviours

Vincent LE HOUEROU¹, Valentin HISLER^{1,2}, Christian GAUTHIER¹, Michel NARDIN², Laurent VONNA²¹Institut Charles Sadron (I.C.S.), CNRS UPR 022 - Strasbourg, France; ²Institut de Science des Matériaux de Mulhouse (IS2M) - CNRS UMR 7361, Mulhouse**10:50-11:10**

Analysis of heat partition and bulk temperature jump in sliding contact problem

Yuwei LIU^{1,3,2}, Yong Hoon JIANG^{1,3,2}, Ames Richard BARBER^{1,3,2}¹China University of Mining & Technology, China; ²University of Michigan, USA;³Yonsei University, South Korea**11:10-11:30**

Clumping criteria of vertical nanofibers on surfaces

Ming ZHOU

*Guangxi University of Science and Technology, China***11:30-11:50**

Peeling of elastic thin films from substrates of soft material

Nicola MENGHA, Luciano AFFERRANTE, Giuseppe CARBONE, Giuseppe P. DEMELIO

*Politecnico di Bari, Italy***11:50-12:10**

Modeling and analysis of rough surface with arbitrary geometrical shape based on fractal theory

Yuchen DAL, Jianmeng HUANG

*Fuzhou University, China***Room 201D****Track 2: Wear & Surface Engineering****Tribo-materials IV**Chair: Nikolai MYSHKIN, *Metal-Polymer Research Institute of Belarus National Academy of Sciences, Belarus***8:30-8:50**

Design and Performances of Adaptive Lubricating Composites in a Wide Temperature Ranges

Junhong JIA, Gewen YI, Xiaochun FENG, Eryong LIU

*Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, China***8:50-9:10**

Effect of Preparation Technology on Arc Erosion Resistance of MgO/Cu Contact Materials

Xiuhua GUO

*Henan University of Science and Technology, China***9:10-9:30**Spark Plasma Sintered WC-Ni-Cr Based Self-lubricating Composites with Addition of WS₂ Solid Lubricant

Bin WU

Tsinghua University, China

9:30-9:50

Dry sliding wear behavior of tri-ceramic reinforced copper based hybrid composites

Rekesh Kumar GAUTAM, Manvandra Kumar SINGH

Indian Institute of Technology (Banaras Hindu University) Varanasi, India

9:50-10:10

Successes in Synthesis of New Green Tribology Materials

Vladimir LEVCHENKO¹, Vladimir MATVEENKO¹, Iliya BUYANOVSKI², Andrey BOLSHAKOV²

¹Lomonosov Moscow State University, Russia; ²Blagonravov Institute of Machine Science, Russia

10:10-10:30

Tribology of hard reinforced particles cold-sprayed coatings

Sylvie DESCARTES¹, Richard CHROMIK², Yinyin ZHANG², Michael SHOCKLEY³

¹INSA Lyon - LaMCoS, France; ²McGill University, Canada; ³NRC, Canada

10:30-10:50

Coffee Break

Room 201D

Track 2: Wear & Surface Engineering

Tribo-materials V

Chair: Sergey PANIN, ISPM SB RAS, Russia

10:50-11:10

High temperature tribological behaviors of microarc oxidation coatings on Ti-35Nb-9Zr alloy

Lin CHEN, Yao QU, Kejian WEI, Xiaoyue JIN, Bin LIAO, Wenbin XUE

Beijing Normal University, China

11:10-11:30

Impact of Fe-intermetallic compounds on the hardness and wear resistance performance of laser alloyed AISI 1015 steel

Olawale FATOBA¹, Elizabeth MAKHATHA¹, Esther AKINLABI¹, Patricia POPOOLA²

¹University of Johannesburg, South Africa; ²Tshwane University of Technology, South Africa

11:30-11:50

Effect of in-situ modification on the tribological properties of synthetic magnesium silicate hydroxide as lubricant additives

Kai GAO, Qiying CHANG, Bin WANG

Beijing Jiaotong University, China

11:50-12:10

Improved tribological behaviors of graphene/polytetrafluoroethylene composite

Xiao WANG, Junwei WU, Luhai ZHOU, Xicheng WEI

Shanghai University, China

12:10-12:30

Fabrication, Microstructure and High Temperature Tribological Properties of Hot-pressed hBN-SiC-ZrO₂ Ceramics in Sliding against Different Metallic Counterfaces

Jiahu OUYANG, Heng WEN, Lei CHEN, Zhanguo LIU, Yujin WANG

Harbin Institute of Technology, China

12:10-13:30

Lunch

Room 201D

Track 2: Wear & Surface Engineering

Heat Treatment I

Chair: Xiqun LU, Harbin Engineering University, China

13:30-13:50

Sliding and impact wear resistance of tool steel after deep cryogenic treatment

Bojan PODGOMIK, Marko SEDLAČEK, Ana KRAČUN, Fevzi KAFEXHIU

Institute of Metals and Technology, Slovenia

13:50-14:10

Study on properties of Ti13Nb13Zr after carburizing

Junyang WANG, Xu RAO, Yong LUO

China University of Mining and Technology, China

14:10-14:30

Improving the wear resistance of CrWMn by deep cryogenic treatment

Kaixuan GU, Jianpeng ZHENG, Jia GUO, Yuan ZHOU, Junjie WANG

CAS, China

14:30-14:50

Two phase ratio recovery for deteriorated duplex stainless steel by laser surface treatment

Yang SONG^{1,2}, Peng WEN^{1,2}, Haiyan ZHAO^{1,2}

¹Tsinghua University, China; ²Ministry of Education, China

14:50-15:10

Approach to controllable tribological properties of sintered polycrystalline diamond compact through annealing treatment

Wen YUE^{1,2}, Jiansheng LI¹, Wenbo QIN¹, Chengbiao WANG^{1,2}

¹School of Engineering and Technology, China; ²Key Laboratory on Deep Geo-drilling Technology of the Ministry of Land and Resources, China

15:10-15:30

Tribological properties of TC4 titanium alloy treated by plasma nitriding at different temperatures

Yungang YUAN

China University of Geosciences, China

15:30-15:50

Coffee Break

Room 203A

Track 2: Wear & Surface Engineering

Surface Modification I

Chair: Ali ERDEMIR, Agonne National Lab. USA

8:30-9:00 Keynote

Surface and Interface design for friction control

Stephen HSU

George Washington University, USA

9:00-9:20

Friction properties of nanostripe inducing structures in vacuum environment

Yasuhisa ANDO, Shunsuke ABE, Masatoshi SAITO

Tokyo University of Agriculture and Technology, Japan



9:20-9:40**A key technology for reducing frictional run-in period of amorphous carbon film**Cheng CHEN¹, Peidong XUE^{1,2}, Dongfeng DIAO¹¹Shenzhen University, China; ²Xi'an Jiaotong University, China**9:40-10:00****Effect of irradiation on the frictional performance of sintering materials**Wenkai ZHENG¹, Ying LIU¹, Yuming WANG¹, Guoping WU², Mingjie QI²¹Tsinghua University, China; ²Ningbo Vulcan Mechanical Seal Manufacturing Co. Ltd., China**10:00-10:20****Microstructure and tribological properties of Ti ion implanted cronidur 30 bearing steel**

Jie JIN, Tianmin SHAO

State Key Laboratory of Tribology, Tsinghua University, China

10:20-10:40**Coffee Break****Room 203A****Track 2: Wear & Surface Engineering****Surface Modification II****Chair: Yasuhisa ANDO, Tokyo University of Agriculture and Technology, Japan****10:40-11:05 Invited****Effect of surface modification on surface properties and tribological behaviours of titanium alloys**

Yong LUO

China University of Mining and Technology, China

11:05-11:25**Characteristic of modified spiral bearing and its seals effect through geometries and dimension modification**Norliza MARUSMAN¹, Mohd Danial IBRAHIM¹, Yuta SUNAMI², Aidil Azli ALIAS¹, Siti Nur Azizah AMRAN¹, Saad Salahuddin MUSA¹, Mohd Rahmat A RAHMAN¹, Yana Shaheera YUNOS¹, Muhammad Zaidi MOHTAR¹, Lee Kwang WONG¹¹Universiti Malaysia Sarawak, Malaysia; ²Tokai University, Japan**11:25-11:45****Enhanced wear resistance of mechanically modified tin plating**Jian SONG¹, Stephan HANSMANN², Christian KOCH¹, Haomiao YUAN¹, Vitali SCHINOW¹¹Ostwestfalen-Lippe University of Applied Sciences, Germany; ²Gebr. Kemper GmbH + Co. KG, Germany**11:45-12:05****Characterization of N+C, Ti+N and Ti+C ion implantation into Ti6Al4V alloy**

Xingguo FENG

Lanzhou Institute of Physics, China

12:05-12:25**Tribological evaluation of new surface modifications for cold rolling mill rolls**Jose Lucio GONCALVES JUNIOR^{1,2}, Jose Daniel Biasoli DE MELLO^{1,3}, Henara Lillian COSTA^{1,4}¹Federal University of Uberlandia, Brazil; ²Federal University of Goias, Brazil;³Federal University of Santa Catarina, Brazil; ⁴Federal University of Rio Grande, Brazil**12:30-13:30****Lunch****Room 203A****Track 2: Wear & Surface Engineering****Surface Modification III****Chair: Yong LUO, China University of Mining and Technology, China****13:30-13:50****Tribological investigations on tailored formed axial bearing washers**Gerhard POLL¹, Florian PAPE¹, Timm COORS¹, Alexander BARROI², Jörg HERMSDORF², Stefan KAERLE², Tim MATTHIAS¹, Christian BONK¹, Anna CHUGREEVA¹, Anas BOUGUECHA¹, Bernd-Arno BEHRENS¹, Ludger OVERMEYER²¹Leibniz Universität Hannover, Germany; ²Laser Zentrum Hannover e.V., Germany**13:50-14:10****Residual stresses induced by cavitation peening**Emmanuel SONDE^{1,2}, Thibaut CHAISE¹, Daniel NELIAS¹, Cyril MAUGER¹, Nicolas BOISSON¹¹Univ Lyon, France; ²AREVA NP Lyon, France**14:10-14:30****Effects of UV radiation on the friction behavior of thermoplastic polyurethanes**Géraldine THEILER, Volker WACHTENDORF, Anna ELERT, Steffen WEIDNER
Bundesanstalt für Materialforschung und -prüfung, Germany**14:30-14:50****Surface modification of hybrid-fabric composites with amino silane and polydopamine for enhanced mechanical and tribological behaviors**

Junya YUAN, Zhaozhu ZHANG

University of Chinese Academy of Sciences, China

14:50-15:10**Tribological performance of surface engineered low-cost beta titanium alloy**

Xiaoying LI, Eleanor REDMORE, Hanshan DONG

University of Birmingham, United Kingdom

15:10-15:30**The wear characteristic and deformation mechanism of QT500-7 nodular cast iron performed by atmospheric plasma beam shock peening**

Wei DAI, Zhizhen ZHENG, Jianjun LI

Huazhong University of Science and Technology

15:30-15:50**Coffee Break**

Room 203B

Track 2: Wear & Surface Engineering

Tribo-corrosion I

Chair: Minhao ZHU, Southwest Jiaotong University, China

8:30-8:50

Abrasion-corrosion of PTA inconel 625 deposits

Henara COSTA^{1,2}, Regina GARCIA²¹Universidade Federal do Rio Grande, Brazil; ²Universidade Federal de Uberlandia, Brazil

8:50-9:10

Enhanced cavitation erosion-corrosion resistance of friction stir processed high entropy alloy

Harpreet Singh GREWAL¹, Rakesh NAIR¹, Sundeep MUKHERJEE², Harpreet Singh ARORA¹¹Shiv Nadar University, India; ²University of North Texas, USA

9:10-9:30

Tribocorrosion study of tin bronze in contact with bearing steel in synthetic sea water

Elina HUTTUNEN-SAAIRIVIRTA, L. KILPI, L. CARPEN, H. RONKAINEN

VTT Technical Research Centre of Finland Ltd, Finland

9:30-9:50

Effects of particle angularity on three-body abrasion-corrosion of high-Cr white cast irons

Mobin SALASI, Grazyna STACHOWIAK, Gwidon STACHOWIAK

Curtin University, Australia

9:50-10:10

Study on Impact-fretting Wear of 304 Austenitic Stainless Steel

Yoshiki SATO, Yuta NAKAGAWA, Bo ZHANG

Saga University, Japan

10:10-10:30

Coffee Break

Room 203B

Track 2: Wear & Surface Engineering

Tribo-corrosion II

Chair: Guoxin XIE, Tsinghua University, China

10:30-11:50

Comparison of Two- and Three-body Abrasion-corrosion of 316L Stainless Steel

Grazyna STACHOWIAK, Mobin SALASI, Gwidon STACHOWIAK

Curtin University, Australia

10:50-11:10

Study of the tribocorrosion behaviours of albumin on a cobalt-based alloy using SKPFM and AFM

Yu YAN, Zhongwei WANG, Lijie QIAO

University of Science and Technology Beijing, China

11:50-13:30

Lunch

Room 203B

Track 2: Wear & Surface Engineering

Tribo-corrosion III

Chair: Yu YAN, Beijing University of Science and Technology, China

13:30-13:50

Influence of corrosion inhibitor content in sliding CO₂ corrosion on wear and coefficient of friction for steel tubingsAndreas TRAUSMUTH¹, Manel RODRIGUEZ RIPOLL¹, Gerald ZEHETHOFER², Ronald SCHÖNGRUNDNER³, Ewald BADISCH¹¹AC2T research GmbH, Austria; ²OMV Exploration & Production GmbH, Austria;³voestalpine Tubulars GmbH&Co KG, 8652 Kindberg-Aumühl, Austria

13:50-14:10

Seawater induced tribo-corrosion of marine alloys

Robert WOOD

University of Southampton, United Kingdom

14:10-14:30

Study on erosion-corrosion behavior of metal foam/polyurethane co-continuous composite

Junxiang WANG, Deli DUAN, Shengli JIANG, Sihang HOU, Shu LI

Institute of Metal Research, Chinese Academy of Sciences, China

14:30-14:50

Tribocorrosion behavior of 410SS in artificial seawater: effect of applied potential

Beibei ZHANG^{1,2}, Jianzhang WANG¹, Yue ZHANG^{1,2}, Gaofeng HAN^{1,2}, Fengyuan YAN¹¹Lanzhou Institute of Chemical Physics, China; ²University of Chinese Academy of Sciences, China

14:50-15:10

Tribocorrosion of zinc-doped TiO₂ nanotubular anodic filmsLuís ROCHA^{1,2,5}, Sofia ALVES^{2,3}, André ROSSI⁴, Paulo FILLO^{1,5}, Jean-Pierre CELIS⁶, Tolou SHOKUHFA^{3,7}¹Universidade Estadual Paulista, Brazil; ²Center of MicroElectroMechanical Systems, Portugal; ³US Branch of the Institute of Biomaterials, USA; ⁴BrazilianCenter for Research in Physics, Brazil; ⁵Brazilian Branch of the Institute ofBiomaterials, Brazil; ⁶KU Leuven, Belgium; ⁷University of Illinois at Chicago, USA

15:10-15:50

Coffee Break

Room 203B

Track 2: Wear & Surface Engineering

Surface Exploration I

Chair: Xinchun CHEN, Tsinghua University, China

15:30-15:55 Invited

Stress control based design of coating/substrate systems

Tianmin SHAO, Xiao HUANG, Hongfei SHANG, Zhe GENG

Tsinghua University, China

15:55-16:15

The preparation and elastic properties of core-shell structured polystyrene/SiO₂ composite nanoparticle

Xu CAO, Dan GUO, Guoshun PAN

Tsinghua University, China



16:15-16:35**Computation of rough engineering surfaces**Szerena Krisztina UJVARI¹, Ivana RISTIC¹, Andras VERNES^{1,2}, Carsten GACHOT^{1,3}¹AC2T research GmbH, Austria; ²Technische Universität Wien, Austria**16:35-16:55****A mixed lubrication analysis of a thrust washer bearing with fractal rough surfaces**Xiaohan ZHANG¹, Yang XU¹, Robert JACKSON¹, Timothy PARSONS², Jianpeng FENG²¹Auburn University, USA; ²Oiles America Corporation, USA**16:55-17:15****Hot nano-indentation modeling of high temperature Ni alloys under Helium environment**

Ali BEHESHTI, Sepehr SALARI

Lamar University, USA

17:15-17:35**Wetting behavior of an underwater oil droplet on structured surfaces: a comparison between theoretical, experimental and simulation study**Shuai CHEN¹, Jiadao WANG², Gang ZHANG¹, Yongwei ZHANG¹¹A*Star, Singapore; ²Tsinghua University, China**17:35-17:55****Capturing molecular interactions in lubricants and fluid/solid interfaces**

James EWEN, David M. HEYES, Daniele DINI

Imperial College London, UK

Room 305C**Track4: Biotribology & Biomimetics****BioSurface & Contact I****Chair: Bharat BHUSHAN, The Ohio State University, America****08:30-09:00 Keynote****Understanding how medical implant materials interact with their environment in tribological contacts**

Anne NEVILLE

University of Leeds, England

09:00-09:20**In vitro hydrogel friction on mucin-producing corneal cells**

Angela A. PITENIS, Juan Manuel URUENA, Tristan T. HORMEL, Tapomoy BHATTACHARJEE, Kyle D. SCHULZE, Thomas E. ANGELINI, W. Gregory SAWYER

University of Florida, America

09:20-09:40**Catheter friction and testing rig in urethra model**

Troels RON, Seunghwan LEE

Technical University of Denmark, Denmark

09:40-10:00**The potential role of tribocorrosion on in-Stent restenosis**

Emily CLARK, Karen PORTER, Michael BRYANT

University of Leeds, England

10:00-10:20

Coffee Break

Room 305C**Track4: Biotribology & Biomimetics****BioSurface & Contact II****Chair: Anne NEVILLE, University of Leeds, England****10:20-10:50 Keynote****Bioinspired mechanically durable superliquiphilic/phobic surfaces**

Bharat BHUSHAN

The Ohio State University, America

10:50-11:10**Friction measurements with chocolate in a simulated tongue-palate contact.**

Philippa CANN, Marc MASEN

Imperial College London, England

11:10-11:30**Biolubrication and its modulation: Taking saliva as an example**

Hongping WAN, Deepak H. VEEREGOWDA, H. C. VAN DER MEI, H.J.

BUSSCHER, Herrmann ANDREAS, K. Sharma PRASHANT

University of Groningen and the University Medical Center Groningen; Zernike Institute for Advanced Materials; University of Groningen

11:30-11:50**Wedged anisotropic dry adhesive fabricated with ultra-precision diamond cutting**Dashuai TAO¹, Xing GAO¹, Hongyu LU¹, Zheyu LIU¹, Yong LI¹, Hao TONG¹, Yonggang MENG¹, Noshir PSEIKA^{1,2}, Yu TIAN¹¹Tsinghua University, China; ²Tulane University, America**11:50-12:10****Bionic frictional driving dominated by intermolecular adhesion**

Keju JI, Feiqian GUO, Guiyun MENG, Zhendong DAI

Nanjing University of Aeronautics and Astronautics, China

12:20-13:30

Lunch

Room 305C**Track4: Biotribology & Biomimetics****Biomaterials I****Chair: Feng ZHOU, Lanzhou Institute of Chemical Physics, China****13:30-13:50****Composite hydrogel: A new tool for reproducing the mechanical behaviour of soft human tissues**Zhengchu TAN¹, Antonio FORTE¹, Cristian FERDINANDO PARISI², Rodriguez Y BAENA³, Daniele DINI¹¹Imperial College London, Enaland; ²Tissue Engineering and Biophotonics Division, King's College London, Enaland; ³Mechatronics in Medicine, Mechanical Engineering, Imperial College, England**13:50-14:10 Cancelled****Highly efficient moisture-enabled power-generation device from flexible carbon dot gel film**

Ming ZHOU

State Key Laboratory of Tribology, China



14:10-14:30**Multistage composite structure hydrogel with high strength and low friction**Jin ZHAO, Yuhong LIU, Pengxiao LIU
*Tsinghua University, China***14:30-14:50****Tribological properties of surface texturing padded with hydrogel**Junde GUO¹, Yu LI², Guangneng DONG¹¹*Xi'an Jiaotong University, China;* ²*Department of Applied Chemistry, School of Science Xi'an Jiaotong University, China***14:50-15:10****Nanoporous substrate-infiltrated hydrogels: a bioinspired solution for high load bearing, tunable friction and under water adhesion**Michele SCARAGGI^{1,4}, Shuanhong MA^{2,3}, Feng ZHOU², Daniele DINI⁴¹*Università del Salento, Italia;* ²*Lanzhou Institute of Chemical Physics, China;*³*University of the Chinese Academy of Sciences, China;* ⁴*Imperial College London, England***15:10-15:30****Growing polymer brushes from a hydrogel surface: a step towards imitating articular cartilage**Joydeb MANDAL
*ETH Zurich, Switzerland***15:30-15:50****Coffee Break****Room 305C****Track4: Biotribology & Biomimetics
Biomaterials II****Chair: Ming ZHOU, State Key Laboratory of Tribology, China****15:50-16:15 Invited****Induction of long-lived room-temperature phosphorescence of N-doped grapheme quantum dots by water in hydrogen bonded matrices**

Ming ZHOU, Qijun LI

*State Key Laboratory of Tribology, Tsinghua University, China***16:15-16:35****Mathematical interpretation of ""cross-shear"" wear for UHMWPE**Aiguo WANG¹, Shirong GE²¹*Trauson Medical Instrument (China) Company, China;* ²*China University of Mining & Technology, China***16:35-16:55****AFM study of Nanomechanics of liposomes on titanium alloy**

Yiqin DUAN, Yuhong LIU, Hongyu SHI, Jian SONG, Shizhu WEN

*State Key Laboratory of Tribology, China***16:55-17:15****Lubrication by polymer brushes and friction control**Feng ZHOU
*Lanzhou Institute of Chemical Physics, China***17:15-17:35****Cartilaginous tissue formation by cultured chondrocytes under traction loading**Yoshinori SAWAE, Keisuke FUKUDA, Yoshifumi SHIGYO, Hideaki ARIURA, Takehiro MORITA, Tetsuo YAMAGUCHI
*Kyushu University, Japan***17:35-17:55****Temperature measurement during drilling of acrylic composite materials for development of bone biomodels**Yuta MURAMOTO¹, Vincent FRIDRICI², Philippe KAPSA², Gaëtan BOUVARD², Makoto OHTA³¹*Graduate School of Biomedical Engineering, Tohoku University, Japan;*²*Laboratoire de Tribologie et Dynamique des Systèmes UMR CNRS 5513 ECL-ENISE, Ecole Centrale de Lyon – Université de Lyon, France;* ³*Institute of Fluid Science, Tohoku University, Japan***17:55-18:15****Frictional behaviors of wound dressings**Xiangqiong ZENG¹, Lin LIN², Jiusheng LI²¹*Advanced Lubricating Materials Laboratory, Shanghai Advanced Research Institute, Chinese Academy of Sciences, China;* ²*Shanghai Advanced Research Institute, Chinese Academy of Sciences, China***Room 305E****Track6: Engine and Transmission Tribology
Gears I****Chair: Thomas LOHNER, Technical University of Munich, Germany****8:30-8:50****Effect of running-in-load and speed-on surface characteristics of honed gears**Dinesh MALLIPEDDI, Mats NORELL, Mario SOSA, Lars NYBORG
*Chalmers University of Technology, Sweden***8:50-9:10****Micropitting damage in gear teeth contacts: influencing factors and mechanisms of their action**Amir KADIRIC¹, Pawel RYCERZ¹, Guillermo MORALES²¹*Imperial College London, UK;* ²*SKF Engineering and Research Centre, Netherlands***9:10-9:30****In-situ testing of wear and fatigue on gear segments**Florian GRÜN¹, Tobias KOBLMILLER¹, István GÓDOR¹, Werner SCHADLER²¹*Montanuniversität Leoben, Austria;* ²*MAHLE Filtersysteme Austria, Austria***9:30-9:50****The tribology of PEEK gear contact simulated using the TE 77 EP - gear dynamic contact**Zainab SHUKUR, K. D DEARN, S. N KUKUREKA
*University of Birmingham, UK***9:50-10:10****At the 'PEEK' of gear performance: the evolution of the wear of PEEK and PMC gears at high temperatures**Karl DEARN, S KONO, A B CROPPER
*University of Birmingham, UK***10:10-10:30****Coffee Break****Room 305E****Track6: Engine and Transmission Tribology
Gears II****Chair: Karsten Stahl, Technical Univ. of Munich, Germany**

10:30-10:50**TEHL simulation on the influence of lubricants on the frictional losses of DLC coated gears**

Andreas ZIEGLTRUM, Thomas LOHNER, Karsten STAHL

*Technical University of Munich, Germany***10:50-11:10****Numerical modeling and validation of oil distribution and churning losses in gearboxes**

Hua LIU, Thomas JURKSCHAT, Thomas LOHNER, Karsten STAHL

*Technical University of Munich, Germany***11:10-11:30****A test procedure to investigate lubricant-surface combination for high performance racing transmissions**

Edward HUMPHREY, Nick MORRIS, Ramin RAHMANI, Homer RAHNEJAT

*Loughborough University, UK***11:30-11:50****Thermal modelling of mixed non-newtonian thermo-elastohydrodynamics contact in dry sump lubrication system**

Ehsan FATOUREHCHI, Mahdi MOHAMMADPOUR, Ramin RAHMANI,

Stephanos THEODOSSIADES, Homer RAHNEJAT

*Loughborough University, UK***11:50-12:10****Non-newtonian thermal elastohydrodynamic lubrication in point contact for modified double helical gears**Lijun PAN¹, Changjiang ZHOU^{1,2}, Xu HAN¹¹Hunan University, China; ²Central South University, China**12:10-12:30****Tangential and normal oil film stiffness and damping for modified spur gears in non-newtonian transient thermal elastohydrodynamic lubrication**Zeliang XIAO¹, Changjiang ZHOU^{1,2}, Siyu CHEN²¹Hunan University, China; ²Central South University, China**12:30-13:30**

Lunch

Room 305E**Track6: Engine and Transmission Tribology Gears III****Chair: Marian SZCZEREK, National Research Institute, Poland****13:30-13:50****Friction, wear and lubrication of coated spiral bevel gears**

Remigiusz MICHALCZEWSKI, Marek KALBARCZYK, Waldemar TUSZYNSKI,

Anita MANKOWSKA-SNOPCZNSKA, Edyta OSUCH-SLOMKA, Marian

SZCZEREK, Elzbieta ROGOS

*National Research Institute (ITeE-PIB), Poland***13:50-14:10****Friction reduction in gearboxes by plastic deformation (PD) additives**

Thomas LOHNER, Karsten STAHL

*Technical University of Munich, Germany***14:10-14:30****The dynamic performance analysis of gear train with one way meshing sliding**

Heyun BAO, Rupeng ZHU, Fengxia LU, Guanghu JIN

*Nanjing University of Aeronautics and Astronautics, China***14:30-14:50****Influence of textured teeth faces on the vibration behavior of meshed spur gears**

N. GUPTA, N. TANDON, R. K. PANDEY

*Indian Institute of Technology Delhi, India***14:50-15:10****Investigation of power loss and contact conditions of a DLC coated helical gear pair considering limiting shear stress behavior of the lubricant**

Ronny BEILICKE, Lars BOBACH, Dirk BARTEL

*Otto von Guericke University Magdeburg, Germany***15:10-15:30****Lubricated tooth contact analysis of hypoid gears**Gajarajan SIVAYOGAN¹, Mahdi MOHAMMADPOUR¹, Ramin RAHMANI¹,Homer RAHNEJAT¹, Guenter OFFNER², Martin SOPOUCH²¹University of Loughborough, UK; ²AVL List GmbH, Austria**15:30-15:50**

Coffee Break

Room 305E**Track6: Engine and Transmission Tribology Gears IV****Chair: Zainab SHUKUR, University of Birmingham, UK****15:50-16:10****Influence of lubricant on shift performance of manual transmissions**

Dmitriy SHAKHVOROSTOV, Anatolij SMIRNOV, Christoph WINCIERZ

*Evonik Resource Efficiency GmbH, Germany***16:10-16:30****On friction-drive model of metal belt continuously variable transmission under slip control situation**

Yuanqiang TAN, Shiping YANG, Jingang LIU, Xiaoru ZHANG

*Huaqiao University, China***16:30-16:50****Efficiency optimization and investigation of the lubricant distribution in a high-speed gearbox as part of the speed2E project**

Alexander FRIEDL

*University of Hanover, Germany***16:50-17:10****Gear durability performance derived from anti-wear additives applied to continuously variable transmission fluids**

Keiichi NARITA

*Idemitsu Kosan Co., Ltd., Japan***17:10-17:30****The selection of thin coatings and gear oils to improve the durability of planetary gears in mining conveyors**Marian SZCZEREK¹, Remigiusz MICHALCZEWSKI¹, Witold PIEKOSZEWSKI¹,Andrzej WIECZOREK^{1,2}, Jan WULCZYNSKI¹¹National Research Institute, Poland; ²Silesian University of Technology, Poland"

17:30-17:50

Design optimization research on double helical gear of high efficiency

Fengxia LU, Weiping LIU, Rupeng ZHU, Heyun BAO, Guanghu JIN

Nanjing University of Aeronautics and Astronautics, China

17:50-18:10

Effective stiffness of an assembled shaft with a regularized coulomb law

Jean-louis LIGIER, Mathieu BENOIT

HEIG-VD, Switzerland

Room 307**Track6: Engine and Transmission Tribology****Tribology Materials II****Chair: Guoxin XIE, Tsinghua University, China**8:30-9:00 **Keynote**

Insights of engine friction reduction and wear control technology and future trends for improving energy sustainability and environmental opportunity

Simon TUNG

Tung Innovation Technology Consulting, Inc, USA

9:00-9:20

Synthesis and tribological properties of spark plasma sintering NiCr-Cr₂AlC composites at elevated temperature

Yufeng LI, Xinliang LI, Hong YIN

Harbin Institute of Technology Shenzhen Graduate School, China

9:20-9:40

Thermal response of M50 steel tribopairs in sliding-rolling contacts under mixture lubrication

Kun SHU, Le GU, Chuanwei ZHANG

Harbin Institute of Technology, China

9:40-10:00

Fetting fatigue crack formation in Ni-base single-crystal superalloys: in-situ SEM experiment and crystal plasticity analysis

Qinan HAN^{1,2}, Wenhui QIU¹, Yibo SHANG¹, Huiji SHI¹¹Tsinghua University, China; ²Aircraft Strength Research Institute of China, China

10:00-10:20

Coffee Break

Room 307**Track6: Engine and Transmission Tribology****Tribology Materials III****Chair: David ECKOLD, University of Birmingham, United Kingdom**

10:20-10:40

Tribological behaviour of short carbon fibre reinforced PEEK under diesel lubrication

Daniel NADERMANN¹, Philipp DIETRICH^{1,2}, Gregor KORN¹, Huber SCHWARZE³¹Robert Bosch GmbH - Corporate Sector Research, Germany; ²Aalen University of applied Sciences, Germany; ³Clausthal University, Germany

10:40-11:00

Printing the spine: PEEK as a bearing material

David ECKOLD, Karl DEARN, Duncan SHEPHERD

University of Birmingham, United Kingdom

11:00-11:20

Friction of hybrid filled PEEK composites sliding against WC-Ni under water lubrication in start-up period

Gaolong ZHANG¹, Ying LIU¹, Yuechang WANG¹, Xiangfeng LIU¹, Ga ZHANG², Yuming WANG¹¹Tsinghua University, China; ²State Key Laboratory of Solid Lubrication, Lanzhou Institute of Chemical Physics, Chinese Academy of Science, China

11:20-11:40

The tribological performance of polytetrafluoroethylene and polyimide composites in adverse operating conditions

Fuzhi SONG, Zenghui YANG, Yong SUN, Qihua WANG, Tingmei WANG

Lanzhou Institute of Chemical Physics of the Chinese Academy of Sciences, China

11:40-12:00

Friction of short-cut aramid fiber reinforced elastomer: the effect of fiber orientation

M. Khafidh^{1,2}, D.J. Schipper¹, M.A. Masen³, N. Vleugels^{1,2}, J.W.M. Noordermeer¹¹University of Twente, The Netherlands; ²Dutch Polymer Institute, The Netherlands; ³Imperial College, United Kingdom

12:20-13:30

Lunch

Room 308**Track7: Industrial Tribo-systems****Tribology of Machine Elements****Chair: Jian LI, Wuhan Research Institute of Materials Protection, China**8:30-9:00 **Keynote**

Tribological Behavior and Thermoelastic Instability Arising in Ball-Screw-Like Specimens Operating in Dry Contacts and with Grease Lubrications

Jenfin LIN

Cheng Kung University, Taiwan, China

9:00-9:25 **Invited**

The research of contact force model in multibody systems with clearance joints

Wei CHEN, Fang YANG

Xi'an Jiaotong University, China

9:25-9:45

Geometrical analysis of the roller screw mechanism

Sebastian SANDU^{1,2}, Nans BIBOULET¹, Daniel NELIAS¹, Folly ABEVI²¹University of Lyon, France; ²SKF Transrol, France

9:45-10:05

Research on tribological performance of surface-textured steel alloy for the retainer in EHAP

Yuan CHEN, Junhui ZHANG, Bing XU, Min HU

The State Key Laboratory of Fluid Power and Mechatronic Systems, China

10:05-10:30

Coffee Break



***POSTER** TIME*



PS1- Science of Tribology & Lubrication and Lubricants & Tribology in Manufacturing

Time: 15:30 - 16:30, 19 September

Venue: Lounge Area, 2nd Floor

- 1 **Temperature of sliding contact between wire rope and friction lining**
Wan MA, A.A. LUBRECHT
Jiangsu Normal university, China; LaMCoS, INSA-LYON, UK
- 2 **A model of rubber friction considering the viscoelasticity of rubber materials**
Guangyu LEE, Xiangjun ZHANG, Robert WITTENBRINK, Jennifer ZHANG, Yonggang MENG
State Key Laboratory of Tribology, China; Exxon Mobil, USA
- 3 **Friction and wear behaviors of Ni-based solid-lubricating composites under high temperature coupled with vacuum environment**
Jun CHENG, Jun YANG, Weimin LIU
Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, China
- 4 **Friction behaviour and material characterisation of vulcanizates**
Dong WANG, Jem RONGONG, Matt CARRE, Lewis ROGER
Sheffield University, UK
- 5 **An original tribometer coupling a free-oscillation dynamic tribotest with a conventional linear reciprocating tribometer**
Amal HRIOUECH, Michel BELIN, Joel PERRET-LIAUDET, Maria-Isabel DE BARROS, Moussa DIABY
Ecole Centrale de Lyon, Université, de Lyon, France; Psa, Centre technique de Velizy, UK
- 6 **Molecular dynamics simulation of friction mechanisms of amorphous polyethylene**
Shengpeng ZHAN, Haitao DUAN, Jian LI
Wuhan Research Institute of Materials Protection, State Key Laboratory of Special Surface Protection Materials and Application, China
- 7 **Numerical simulation of the dynamic process of friction and wear of PTFE sliding against 45 steel by the discrete element method**
Ting XIE, Ya DING, Bang XIAO, Chenglong WANG
Hefei University of Technology, China
- 8 **Winding-in impact friction characteristics of wire rope in winding hoist**
Yuxing PENG, Shisheng SUN, Zhencai ZHU, Xiansheng GONG, Dagang WANG
School of Mechanical and Electrical Engineering, China University of Mining and Technology, China; Jiangsu Key Laboratory of Mine Mechanical and Electrical Equipment, China; China University of Mining and Technology, China; College of Mechanical Engineering, Chongqing University, China
- 9 **Thermal analysis of pad-disc contact in the high-speed train braking based on ANSYS**
Mingli ZHOU, Yongzhen ZHANG
Henan University of Science and Technology, China
- 10 **Harmonic and transient responses of damping bearing with different constraining layer**
Li HUANG, Jin YONG
Wuhan University of Technology, China
- 11 **Tribological properties of the in-situ synthesized Grapheme/ Nickel Composites**
Jinlong JIANG, Kaichen HE, Jinfang DU, Xianjuan PANG
Lanzhou University of Technology, China; Henan University of Science and Technology, China
- 12 **Analysis of statics of clamp band systems for spacecraft**
Xiaodong GUO, Junsen HOU, Xuefeng TAN, Jieliang ZHAO, Shaoze YAN
Tsinghua University, China
- 13 **Effects of surface defect on grease lubricated EHL point contact**
Chaolin PENG, Haiyan TANG, Xinglin LI
Chang'an University, China; Kunming University of Science and Technology, China; Hangzhou Bearing Test & Research Center, China
- 14 **Friction coefficient and friction reduction of rolling-sliding contact in mixed EHL**
Yali ZHANG, Zhiqiang WANG, Na QIN, Xiaogang ZHANG, Tonghai WU
Southwest Jiaotong University, China; School of Mechanical & Manufacturing Engineering, UNSW Australia, Australia; Xi'an Jiaotong University, China
- 15 **3D rough surface contacts with lubricant using the hybrid simulation method**
Jie ZHANG, Kiet TIEU, Guillaume MICHAL, Hongtao ZHU
School of Mechanical, materials and Mechatronic Engineering, University of Wollongong, Australia
- 16 **Film forming properties under unsteady thin film lubrication**
Weiwei WANG, Zhijun YAN, Jiujuan XU
Dalian Maritime University, China
- 17 **Analytical solution of elastic fluid dynamic lubrication**
Yi LOU, Huran LIU
zhejiang University of science and technology, China
- 18 **The test of high pure lubrication oil film by the principal of back cone**
Yi LOU, Huran LIU
zhejiang University of science and technology, China
- 19 **A contact angle hysteresis model based on the fractal structure of triple line**
Shuai WU, Ming MA
Tsinghua University, China
- 20 **Research on friction and wear properties of finger seal materials**
Hua SU, Shan SUN
Northwestern Polytechnical University, China
- 21 **Dry tribological behaviour of nanocrystalline metals and alloys**
Licai FU, Jun YANG, Weimin LIU
Hunan University, China; Lanzhou Institute of Chemical Physics, China
- 22 **A surface energy based wear model for tribological polymers**
Bo TAO, Jia ZENG, Xiaojun LIU, Kun LIU, Jiaxin YE
Institute of Tribology, School of Mechanical Engineering, Hefei University of Technology, China
- 23 **Surface energy and wear: an adhesive wear model**
Bo TAO, Jia ZENG, Xiaojun LIU, Kun LIU, Jiaxin YE
Institute of Tribology, School of Mechanical Engineering, Hefei University of Technology, China
- 24 **Wear behavior of Al₂O₃-Nb composites manufactured by SPS**
Aline Luísa BANDEIRA DOTTA, Ana Julia TERTULIANO, Izabel Fernanda MACHADO, Maria Cristina MORE FARIAS
Universidade de Caxias do Sul, Brazil; University of Sao Paulo, Brazil

- 25 **Microstructure and tribological properties of 316L liquid phase sintered stainless steel with boron addition**
Francisco LANFERDINI SERAFINI, Marcelle PERUZZO, Tanara DARIVA BEUX, Michell Felipe CANO ORDONEZ, Aline Luísa BANDEIRA DOTTA, Maria Cristina MORE FARIAS
Universidade de Caxias do Sul, Brazil; University of Sao Paulo, Brazil
- 26 **Effect of swelling on tensile properties and abrasion resistance of nitrile rubber with different acrylonitrile contents under water conditions**
Shuyuan SONG, Shijie WANG, Xiaoren LV
Shenyang University of Technology, China
- 27 **Test on wear rule of casing in deep wells and extended reach wells**
Erguo LIANG, Zhongmin WANG, Lei FU, Zifeng LI
Tianjin University of Technology and Education, China; College of Vehicles and Energy, Yanshan University, Qinhuangdao 066004, China
- 28 **Structure and function of PTFE/PEEK transfer film: molecular simulation and experimental investigations**
Tasuku ONODERA, Jun NUNOSHIGE, Kenji KAWASAKI, Koshi ADACHI, Kazue KURIHARA, Momoji KUBO
Hitachi, Japan; Graduate School of Engineering, Tohoku University, Japan; WPI Advanced Institute for Materials Research, Tohoku University, Japan; Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, Japan; Institute for Materials Research, Tohoku University, Japan
- 29 **Computational multiscale modeling of the bipolar electrochemicalp Process on the example of potential-controlled dodecyl sulfate ion adsorption at the aqueous solution – stainless steel interface**
Johannes Laurin HÖRMANN, Yonggang MENG
State Key Laboratory of Tribology, Tsinghua University, China; Technische Universität Berlin, Germany
- 30 **Tribochemical reaction dynamics of carbon nitride thin films by tight-binding quantum chemical molecular dynamics simulations**
Miho NAKAMURA, Seiichiro SATO, Yusuke OOTANI, Yuji HIGUCHI, Nobuki OZAWA, Koshi ADACHI, Momoji KUBO
Tohoku University, Japan
- 31 **Tribological properties and electrical characteristics of triboelectric nanogenerator**
Yanqiang HU
Beijing Institute of Technology, Beijing, China
- 32 **Effect of an electric field on friction of silicon rubber against copper in the glycerol**
Marek GLOGOWSKI, Juliusz B GAJEWSKI
Wroclaw University of Science and Technology, Poland
- 33 **Behaviour of soft nanoadditives under shear flow**
Yingying GUO, Luca DI MARE, Janet WONG
Imperial College London, UK
- 34 **Triboelectrification of Al₂O₃/PTFE composites sliding against 45 steel**
Ting XIE, Bang XIAO, Ya DING, Chenglong WANG
Hefei University of Technology, Anhui, China
- 35 **Rubber-ice friction mechanisms at the mesoscale**
Sylvain HEMETTE, Juliette CAYER-BARRIOZ, Denis MAZUYER
Ecole Centrale de Lyon, Laboratoire de Tribologie et Dynamique des Systèmes, France; Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, Japan
- 36 **On the thermodynamics of running-in**
Hisham ABDEL-AAL
Drexel University, USA
- 37 **Investigation on impact resistance of CFRP laminate under cycling low kinetic energy**
Yang SUN, Zhen-bing CAI, Song-bo WU, Min-hao ZHU
Southwest Jiaotong University, China
- 38 **Polytetrafluoroethylene self-assembly coating used in industrial flue gas filtration material**
Chuan DU, Jiadao WANG, Xiaohong LIU, Tengfei WU
Tsinghua University, China; Tianjin Research Institute for Advanced Equipment, China
- 39 **Sliding friction of fully hydrogenated DLC surfaces using molecular dynamics**
Hirotoshi AKIYAMA, Hitoshi WASHIZU
University of Hyogo, Japan
- 40 **Nano-scale wear characteristics of polymeric materials**
Dong-gap SHIN, Dae-Eun KIM
Department of Mechanical Engineering, Yonsei University, Korea
- 41 **Quantum chemical calculations, synthesis, physicochemical properties and nanotribology of copper and argentum clusters**
Andrey KUZHAROV, Aleksey MILOV, Yulia GERASINA
Don State Technical University, Russia; Southern Research Center of the Russian Academy of Sciences, Russia
- 42 **Molecular dynamics simulation of wetting behavior of a droplet on carbon-nanotubes**
Awais MAHMOOD, Jiadao WANG, Shuai CHEN
Tsinghua University, China; Institute of High Performance Computing, Singapore
- 43 **Numerical experiments on the dynamics of sheared and pulled-off single asperity and the origin of sliding friction**
Ryosuke MINAMI, Hiroshi MATSUKAWA
Aoyama Gakuin University, Japan
- 44 **Understanding of effects of defect in graphite on tribological properties**
Tianying DUAN, Wen YUE, Qunyang LI
China University of Geosciences, Beijing, China; Tsinghua University, Beijing, China
- 45 **The influence of surface chemistry and nanoscopic roughness on the frictional properties of MoS₂ nanosheets**
Zhuotong LIU, James BATTEAS
Texas A&M University, USA
- 46 **How interface interaction influences tribology behavior of two layers graphene with hydroxyls**
Rui LI, Yang CHENG, Chao WU
University of Science and Technology Beijing, China
- 47 **Tribological properties and synergistic effects between stearic acid-modified nano-TiO₂ particles and sulfurized isobutene**
Jiawei SHEN
Shanghai Advanced Research Institute, Chinese Academy of Sciences, China
- 48 **Nanosliding of a Si₃N₄ tip on an oscillating substrate**
Masaru SUZUKI, Tatsuro SUZUKI, Junko TANIGUCHI, Naruo SASAKI, Makoto ISHIKAWA, Kouji MIURA
University of Electro-Communications, Japan; Aichi University of Education, Japan



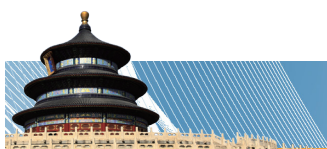
- 49 **Nanotribological behavior of nanopatterned multilayer MoS₂**
Qian WU, Ming ZHOU
Tsinghua University, China
- 50 **Theoretical study of surface interaction force considering one-dimensional periodic material distribution**
Hiroshige MATSUOKA, Toshiki OTANI, Takeshi HIKOSAKA, Satoru MAEGAWA, Shigehisa FUKUI
Tottori University, Japan
- 51 **Atomic-scale friction and superlubricity in two-dimensional materials: the first-principles calculations**
Linfeng WANG, Tianbao MA, Yuanzhong HU, Hui WANG
Nanjing University of Aeronautics and Astronautics, China; Tsinghua University, China
- 52 **In-situ formation of MoS₂ nano-onions acting as rollers in macroscale superlubricity**
Kaiming HOU, Jinqing WANG, Shengrong YANG
Lanzhou Institute of Chemical Physics, China
- 53 **Solutions and algorithm for two-dimensional friction problems**
Xiaosun WANG, J.R. BARBER
Wuhan University, China, University of Michigan, Ann Arbor, USA
- 54 **Modeling of hysteresis nonlinear for bolted joints**
Ling LI
Xi'an University of Architecture and Technology, China
- 55 **Relationship between micro-abrasive wear modes and contact stresses: experimental tests and CAE simulations for AISI H10 tool steel**
Ronaldo COZZA, Gustavo DONATO
University Center of FEI – Educational Foundation of Ignatius “Padre Saboia de Medeiros”, Brazil
- 56 **Changing rule of cutting force in high speed milling of CFRP**
Zhichao WANG
Fuzhou University, China
- 57 **Cyclic tangential loading of a power-law hardening elastic-plastic spherical contact in pre-sliding stage**
Bin ZHAO, Xiqun LU
Harbin Engineering University, China
- 58 **Influence of copper surface morphology on hardness and elastic modulus of micro indentation test with different indenters**
Haosheng PANG, Chenghui GAO, Ming LIU
Fuzhou University, China
- 59 **In-Situ optical tribometry of subsurface crack propagation under sliding herzian contact**
Haiyang ZHANG, Bo TAO, Jia ZENG, Xiaojun LIU, Kun LIU, Jiaxin YE
Institute of Tribology, School of Mechanical Engineering, Hefei University of Technology, China
- 60 **The effect of different load and loading rate on the VonMises equivalent stress of the contact rough body of the base end of micro-cantilever**
Jianmeng HUANG, Lei MIN, Yuchen DAI, Hang ZHANG, Huikai GAO
Fuzhou University, China
- 61 **Theoretical investigation on wear-resistance mechanism for shape memory alloy**
Xiang CHEN, Yang ZHAO, Sheng LU, Rui LI, Xianghe PENG
Institute of Advanced Manufacturing Engineering, Chongqing University of Posts and Telecommunications, China; School of Aeronautics and Astronautic, Chongqing University, China
- 62 **Experimental investigation of oblique collision for robotic two-link manipulator with friction**
Yuehang ZHAO, Yunian SHEN
Nanjing University of Science and Technology, China
- 63 **Transient dynamic computation of frictional contact-impact of flexible robotic two-link manipulator**
Wei WANG, Yunian SHEN
Nanjing University of Science and Technology, China
- 64 **Cancelled**
- 65 **Research on lubrication properties of liquid metal: Ga_{0.64}In_{0.24}Sn_{0.12} alloy**
Aijie XU
Department of Mechanical Engineering, Tsinghua University, China
- 66 **Experimental estimation of viscous and inertial coefficients in the formula of pressure drop for the water flow through the spherical particles layer**
Emir TAIROV, Polina KHAN, Svetlana BYKOVA
Melentiev Energy Systems Institute, Siberian Branch of the Russian Academy of Sciences, Russia
- 67 **Research on rheological and tribological properties of lithium grease containing nano silica**
Jianping LIU, Hong CHEN
Shandong university of technology, China
- 68 **Behaviour of grease EHL films at very low speed**
Hiroshi NISHIKAWA, Naoya IKEDA
Kyushu Institute of Technology, Japan
- 69 **High temperature self-lubricating materials**
Shengyu ZHU, Jun YANG, Jun CHENG
Lanzhou Institute of Chemical Physics, China
- 70 **Research on mechanical mechanism of shear dilatancy for granular flow lubrication**
Fanjing MENG, Kun LIU, Wei WANG
Hubei University of Arts and Science, China; Hefei University of Technology, China
- 71 **Development and application of environmentally friendly high performance semi-synthetic cutting fluid**
Hongqi XIONG
Guangzhou Mechanical Engineering Research Institute Co.Ltd., China
- 72 **Infiltration mechanism and sliding friction and wear behavior of Al₂O₃/HSS self-lubrication composites fabricated by vacuum pressure infiltration process**
YanJun WANG, Shouren WANG, Liying YANG, Gaoqi WANG, Xuefeng YANG
University of Jinan, China
- 73 **Synthesis and investigation of tribological behavior of nano-WS₂ particles**
Na WU, Ningning HU, Songquan WANG
China University of Mining and Technology, China; Jiangsu Normal University, China
- 74 **Tribological properties of Ni-based plasma sprayed coating with different silver content at wide temperature**
Hang LI
Nanjing University of Science and Technology, Nanjing, China



- 75 **Elastohydrodynamic lubrication of bearings in cooling circuit of lead-bismuth based reactor**
Jiaqi SUN, Xuanyu SHENG, Yachen XU
Tianjin Research Institute for Advanced Equipment, Tsinghua University, China; Tsinghua University, China
- 76 **Anti-wear properties of WS₂ nanoparticles at low concentrations**
Shizhao YANG, Jiangqiang HU, Feng XIE, Li GU
Air Force Logistics College, China
- 77 **Loading characteristics of spherical bearings with elastic deformation**
Shengdong ZHANG, Guangming LI, Xiuying YANG, Boying WU, Yiji HUANG
Jiujiang University, China; Wuhan University of Technology, China
- 78 **Elastohydrodynamic lubrication with oil droplets**
Shuyi LI, Feng GUO, Xinming LI, Chenglong LIU
Qingdao university of Technology, China
- 79 **The identification of lubrication state of inner ring and roller element under sliding condition**
Zhihe DUAN, Tonghai WU, Shuaiwei GUO, Tao SHAO, Yanwen HUO
Xi'an Jiaotong University, China
- 80 **Analysis of lubrication with 3D textured surface based on CFD**
Yang ZHAO, Heng LIU, Mingqing JING
Xi'an Jiaotong University, China
- 81 **In-situ study of the distribution of the lubricant additives in the contact area**
Shaohua ZHANG, Yuhong LIU, Tao QING
Beijing Institute of Control Engineering, China; Tsinghua University, China
- 82 **Modification and evaluation of novel functional polyalphaolefin (PAO) using as additive in lubricant**
Jiusheng LI, Xuzhi XUE, Jian XU, Tianhui REN
Shanghai Advanced Research Institute, Chinese Academy of Sciences, China; Shanghai Jiao Tong University, China
- 83 **A safe and environmentally friendly lubricants**
zhuojun CHEN, Yingliang WU
Shenyang Ligong Uiversity, China
- 84 **Study on the tribological properties of naphthylacetic acid ionic liquid lubricant**
wenjing SUN, Chaoyang ZHANG, Shuai ZHANG, Rui DONG, Mingjin FAN, Desuo YANG
Baoji University of Arts and Sciences, China
- 85 **Investigation on the friction characteristics and the lubrication states transition for water lubricated plain journal bearing**
Zhongliang XIE, Zhushi RAO, Na TA
Shanghai Jiao Tong University, China
- 86 **Fundamental and Tribological Properties of Thick CPB**
Keisuke SATO, Hikaru OKUBO, Yuki HIRATA, Chiharu TADOKORO, Tomoya FUJIMORI, Ken NAKANO, Yoshinobu TSUJII, Shinya SASAKI
Tokyo University of Science, Japan; Graduate School of Tokyo University of Science, 6-3-1 Niiyuku, Katsushika-ku, Tokyo, Japan; Saitama University, 255 Shimo-Okubo, Sakura-ku, Saitama-shi, Saitama, Japan; Kyoto University for Chemical Research, Gokasho, Uji-shi, Kyoto, Japan; Yokohama National University, 79-1 Tokiwadai, Hodogaya-ku, Yokohama-shi, Kanagawa, Japan
- 87 **The action mechanism and regularities of the additive for friction-increasing grease**
Yi LIU, Xiangjun ZHANG, Huan LIU, Haoda JING, Simo MAKIMATTILA
Tianjin Research Institute for Advanced Equipment, Tsinghua University, China; Tsinghua University, China; KONE, Poland
- 88 **Enzymatic oligomerization of p-methoxyphenol and phenylamine providing poly (p-methoxyphenol-phenylamine) with improved antioxidant performance in ester oils**
Shengmao ZHANG, Changqing MIAO, Zhijun ZHANG, Pingyu ZHANG
Henan University, China
- 89 **Tribology mechanism study of Cu nano-additives in DLC-based solid-liquid synergetic system**
Yujuan ZHANG, Yaohui LIU, Shengmao ZHANG, Pingyu ZHANG
Engineering Research Center for Nanomaterials, China; Collaborative Innovation Center of Nano Functional Materials and Applications of Henan Province, Henan University, China
- 90 **Study on thermogravimetry property and lubricating behavior of lathanump perhenate as oil additive in a wide temperature range**
Junhai WANG, Sihan HOU, Yang LIU, Deli DUAN, Shu LI
Institute of Metal Research, Chinese Academy of Sciences, China; School of Mechanical Engineering, Shenyang Jianzhu University, China
- 91 **Study on the antiwear properties and synergistic antioxidation of titanate with amine antioxidants in lubricants**
Jianqiang HU, Jianjian ZHANG, Xin XU, Shizhao YANG, Feng XIE
Department of Aviation Oil and Material, Air Force Logistics College, China
- 92 **On the dispersion of biodiesel soot and its influence on the tribological behaviour of liquid paraffin**
Chuan LI, Ruhong SONG, Bingxun YANG, Tianxia LIU, Xianguo HU
Hefei University of Technology, China
- 93 **All-atom molecular dynamics study of absorbing process of organic monolayers**
Masakazu KONISHI, Hitoshi WASHIZU
University of Hyogo, Japan
- 94 **Preparation of water-soluble Cu nanoparticle surface-capped by polyethylene glycol xanthate and evaluation of their tribological properties**
Yan WANG, Chunli ZHANG, Shengmao ZHANG, Pingyu ZHANG
National & Local Joint Engineering Research Center for Applied Technology of Hybrid Nanomaterials, Henan University, China
- 95 **Preparation of oil-soluble copper nanoparticles for lubricant applications**
Yanhong LI, Shengmao ZHANG, Pingyu ZHANG
National & Local Joint Engineering Research Center for Applied Technology of Hybrid Nanomaterials, Henan University, China
- 96 **Antimicropitting investigation of four EP&AW additive containing phosphorus**
Jiping ZHANG, Peng WANG, Yuanjing DAI, Chenhui ZHANG
Tianjin Research Institute for Advanced Equipment, Tsinghua University, China; Tsinghua University, China; PetroChina Lanzhou Lubricating Oil R&D Institute, China



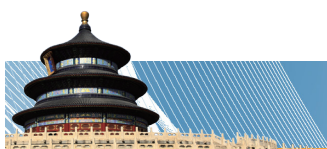
- 97 **Synthesis of size-controlled Ag₂S nanoparticles by solventless thermolytic method and their tribological properties as lubricating oil additive**
Chunli ZHANG, Shengmao ZHANG, Pingyu ZHANG
National & Local Joint Engineering Research Center for Applied Technology of Hybrid Nanomaterials, Henan University, China
- 98 **Observation of tribofilm growth and friction coefficient microscopy of tribofilms**
Sora SHIODE, Renguo LU, Hiroshi TANI, Norio TAGAWA, Shinji KOGANEZAWA
Kansai University, Japan
- 99 **Optimized characterization of lubricant (ISO VG 68) with titanium oxide by response surface methodology (RSM)**
Nor Syahirah MOHAMAD, Salmiah KASOLANG
Tribology Research Group, Faculty of Mechanical Engineering, Universiti Teknologi MARA, 40450 Shah Alam Selangor, Malaysia; Faculty of Mechanical Engineering, Malaysia; Universiti Teknologi MARA, 40450 Shah Alam Selangor, Malaysia
- 100 **Synthesis of carbon spheres and its size dependent water based lubrication**
Guanggui CHENG, Jianning DING, Noshir.S PESIKA, Ying WANG
Jiangsu University, China; Changzhou University, China; Tulane University, USA
- 101 **The study of WS₂ nanoparticles anti-wear and friction reducing properties in the persence of ZDDP additive**
Ningning HU
Jiangsu Normal University, China
- 102 **Antioxidant synergistic effects of environment friendly additive bismuth naphthenate**
Xin XU, Jianqiang HU, Yunyun XU, Yumei WANG
Air Force Logistics College, China
- 103 **Study on the tribological properties of the mixed system of molybdenum dialkyldithio carbamate combining with metal detergent**
Liping WANG, Guangneng DONG, Jinbao XU, Dongya ZHANG, Youbai XIE
PetroChina Lanzhou Lubricating Oil R & D Institute, Lanzhou, China; Key Laboratory of Education Ministry for Modern Design & Rotor-Bearing System, Xi'an Jiaotong University, Xi'an, China; School of Mechanical and Precision Instrument Engineering, Xi'an University of Technology, China
- 104 **Lubricating performance of phytic acid as a water-based lubricant additive in Si₃N₄-copper sliding contact**
Yong WAN, Yankun YU, Shuai GAO, Qi CJEN
Qingdao University of Technology, China
- 105 **Investigation of effect of super-hydrophobic MoS₂/TiO₂ on paraffin**
Leihua XU, Mei LENG, Dekun ZHANG
China University of Mining and Technology, China
- 106 **Graphene-based engine oil**
Shanhong WAN, Yana XIA, Kiet TIEU, Hongtao ZHU, Bach H. TRAN, Shaogang CUI
University of Wollongong, Australia
- 107 **CO₂ influence on amino acid based ionic liquids as lubricating additives**
Jian WU, Xiang YIN, Xiaohua LU, Xin FENG, Yijun SHI
Luleå University of Technology, Sweden; State Key Laboratory of Materials-oriented Chemical Engineering, Nanjing Tech University, Nanjing 210009, China
- 108 **Tribological properties of biological lubricating greases of lard and tallow**
Juozas PADGURSKAS, Raimundas RUKUIZA, Arturas KUPČINSKAS, Raimondas KREIVAITIS
Aleksandras Stulginskis University, Lithuania
- 109 **Analysis of tool wear mechanism in high-speed milling of carbon fiber reinforced polymer**
Youxi LIN, Zhiying REN
Fuzhou University, China
- 110 **Analysis of tool wear mechanism and wear form in high-speed milling of carbon fiber reinforced polymer**
Hua LIN, Youxi LIN, Longyi JIAN
Fuzhou University, China
- 111 **Effects of carbon nanotubes on the friction characteristics of Al₂O₃/TiC ceramic conical die composite**
Xuefeng YANG
School of Mechanical Engineering, University of Jinan, China
- 112 **Tool wear in dry and wet turning**
Joanna KOWALCZYK, Stanisław PLAZA, Łukasz NOWAKOWSKI, Monika MADEJ, Dariusz OZIMINA
The Kielce University of Technology, Poland; University of Lodz, Poland
- 113 **Study on tool wear in Ti₆Al₄V drilling and cutting parameter optimization**
Xiaoqin WANG, Shouren WANG, Xiuli FU, Yongzhi PAN, Jun ZHAO
University of Jinan, China; Shandong University, China
- 114 **Friction torque performance reliability prediction for thin walled angular contact ball bearing**
Hui DU
Henan University of Science and Technology, China
- 115 **Creep behaviors and microstructure of babbitt alloy SnSb₁Cu₆**
Jianmei WANG, Fanning MENG, Yawen XUE
School of mechanical engineering, Taiyuan University of Science and Technology, China
- 116 **Finite element simulation of two-dimensional high speed cutting considering the rough surface of the tool corner**
Lei MIN
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- 143 **Performance analysis of non-circular floating ring bearing under steady-state condition**
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Xu LIU, Xiaoyang CHEN, Peng WANG, Xuejin SHEN, Ben NI
Research Institute of Bearings Shanghai University, China; Ford Motor Company, China
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- 146 **The structural parameters of rolling bearing influence on the dynamic characteristic of the high-speed rotor system**
Jingjing ZHANG, Liqin WANG, Ping GONG
Harbin Institute of Technology, China



- 147 **Experimental study on damage mechanism of skidding for cylindrical roller bearings**
Jun LUO, Xiangyu XIE, Mingwei FANG, Jin XU, Yonggang MENG, Yu CHEN
Guizhou Provincial College-based Engineering Research Center for Materials Protection of Wear and Corrosion, China; College of Chemistry and Materials Engineering, Guiyang University, China; School of Mechanical Engineering, Guizhou University, China; State Key Laboratory of Tribology, Tsinghua University, China; Guizhou Liyang Aero-engine Corporation, China
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Junling LI, Wei CHEN
Xi'an Technological University, China; Xi'an Jiaotong University, China
- 149 **Effects of flexible supporting ways on the performance of thin - walled bearings for robots**
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Henan University of Science and Technology, China, Collaborative Innovation Center of Machinery Equipment Advanced Manufacturing of Henan Province, China
- 150 **Tribological application of elastomer seals and green tribology for energy saving and emission reduction**
Gui-Bin TAN, Xing HUANG, Si-Wei ZHANG
National Engineering Research Center of Rubber&Plastic Sealing, China; College of Mechanical and Transportation Engineering at China University of Petroleum-Beijing, China
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Yuchi KANG, Meihong LIU, Yongfa TAN, Jinbin LIU, Xueliang WANG
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- 152 **Experimental investigation on the uneven bidirectional-wedge frictional wear characteristics of non-contacting finger seals**
Xiangyu HU, Yongjian LI, Kaibing DU, Shuangfu SUO, Yuming WANG
Tsinghua university, China; CCRC Zhuzhou Institute Co.LTD, China
- 153 **An investigation of impact-sliding wear of thermoplastic material**
Jie JIANG, Yiyong YANG, Yongjian LI, Weifeng HUANG
China University of Geosciences (Beijing), China; Tsinghua University, China
- 154 **Investigation of boundary friction property of rubbers for lip seals**
Shigenobu HONDA, Joichi SUGIMURA
NOK Corporation, Japan; Kyushu University, Japan
- 155 **Effect of interference fit on the performance of a wavy-tilt-dam mechanical seal**
Yuechang WANG, Ying LIU, Weifeng HUANG, Yuming WANG
State Key Laboratory of Tribology, Tsinghua University, China
- 156 **Interaction between transfer film formation and wear evolution of glass fiber filled PTFE**
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NOK Corporation, Japan
- 159 **Effects of working conditions on mixed thermo-EHL performance of a helical gear pair involving surface roughness**
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Hubei university of Technology, China
- 160 **Role of tribolayers on friction reduction and scuffing resistance of thermal spray coatings used in internal combustion engines**
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University of Windsor, Canada; General Motors, Canada
- 161 **Stick-slip behaviour analysis in water lubricated rubber bearing**
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- 162 **Experimental evaluation of bio-derived automatic transmission fluid clutch friction performance**
Robert JACKSON, Cade GUEST, Corey DONALDSON, James MARTIN, Bethanee SMITH, Stephen SHAFFER, George COOK, Bernie ROELL, Ray ENGEL, Juncheng LIU, Claude HALL
Auburn University, USA; Bruker Nano Surfaces Division, USA; RSC Bio Solutions, USA; Alto Products Corp., USA



PS2-Wear & Surface Engineering & Biotribology & Biomimetics & Industrial Tribo-systems & Tribotest and Monitoring & Forum of Young Tribologists-Organized by CTI & STLE
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- 163 **Friction and wear behavior of cotton stalk rubbing on electroplated chromium coating**
Youqiang ZHANG, Yonggang MENG
State Key Laboratory of Tribology, Tsinghua University, Beijing 100084, China
- 164 **Analysis of wear mechanism evolvement of the rolling die material on the basis of ring-block test**
G. BIAN^{1,2}, M. CHENG¹, Y. LIU¹, S.H. ZHANG¹
¹Institute of Metal Research, Chinese Academy of Sciences, Shenyang, 110016, China; ²School of Materials Science and Engineering, University of Science and Technology of China, Hefei 230026, PR China
- 165 **Mathematical analysis of the entrapment of solid spherical particles in viscoelastic body/ metal friction pair**
Hongling QIN
China Three Gorges University, 8 University Avenue, Yichang, Hubei 443002, China
- 166 **Effect of various oxide nanoparticles and their combinations on the tribological behavior of PEEK composite reinforced with carbon fibers**
Lihe GUO
Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, No.18, Tianshui Middle Road, Lanzhou, China
- 167 **Micromechanical analysis for fretting wear of interference-fit joint interface in carbon fiber/epoxy composites under service loading**
Danlong SONG, Kaifu ZHANG, Yanchao ZHANG, Jinfu DU
Xi'an University of Technology, China; Northwestern Polytechnical University, China
- 168 **Wear behavior of Ag implantion GH4169 by ion beam assisted bombardment**
Meng XU
Engineering Building #551, Hunan University, China
- 169 **Study on influence of cyclic loading on rail material wear performance**
Caiyun WANG, Qiyue LIU
LanZhou JiaoTong University, China; Southwest Jiao Tong University, China
- 170 **Study on bending fretting fatigue damages of CuMg_{0.4} alloy**
Xiyang LIU, Jinfang PENG, Zhibiao XU, Wulin ZHANG, Jianhua LIU, Minhao ZHU
Tribology Research Institute, Traction Power State Key Laboratory, Southwest Jiaotong University, China; Key Laboratory of Advanced Technologies of Materials of Ministry of Education, Southwest Jiaotong University, China
- 171 **An experimental study on torsional fretting fatigue of EA4T axle steel**
Jinfang PENG, Xiao JIN, Zhibiao XU, Zhenbing CAI, Jianhua LIU, Minhao ZHU
Traction Power State Key Laboratory, Southwest Jiaotong University, China; Tribology Research Institute, Key Laboratory of Advanced Technologies of Materials of Ministry of Education, Southwest Jiaotong University, China
- 172 **Effect of texture pattern on change in topography of AISI 1020 steel when sliding against AISI 8620 steel**
Deepak Kumar PRAJAPATI, Mayank TIWARI
Indian Institute of Technology Patna, India
- 173 **A study on the application of M50 NiL bearing cage-land shoulder**
Dong SUN, Cong Hao LIU
AECC Harbin Bearing co.Ltd, China; Liaoning University of Technology, China
- 174 **Comparison of particle trajectories in the air and helium filled head-disk interface**
Fuhao CUI, Shengnan SHEN, Hui LI, Sen LIU, Shijing WU
School of Power and Mechanical Engineering, Wuhan University, Wuhan, Hubei, China
- 175 **Damage evolution and contact mechanics of interfacial delamination in traveling wave ultrasonic motor**
Yu WANG, Shengnan SHEN, Hui LI, Mang CAI
School of Power and Mechanical Engineering, Wuhan University, Wuhan, Hubei, China
- 176 **Sliding friction and corrosion behavior of medium manganese austenitic steel and martensitic steel**
Jian WANG, Qinliang WANG, Zhengxin HU, Kang XU
China University of Mining and Technology, China
- 177 **Fretting behavior between the interface of PEEK and highly cross-linked polyethylene**
Handong XU, Dekun ZHANG, Kai CHEN
School of Mechanical and Electrical Engineering, China University of Mining and Technology, China
- 178 **Isolation and analysis of artificial joint wear debris**
Tao ZHANG, Dekun ZHANG, Hongtao LIU
Institute of Tribology and Reliability Engineering, China University of Mining and Technology, Xuzhou, Jiangsu, 221116, China
- 179 **Investigations of PTFE wear behavior using molecular dynamics simulation**
Deng PAN
Yanshan University, China
- 180 **Study of friction and wear behaviors of pure carbon strip affected by vibration load during current-carrying sliding**
Yanyan ZHANG, Yongzhen ZHANG, Shangquan BAO
Henan University of Science and Technology, Kaiyuan street, Luolong district, Luoyang, Henan, 471003, China
- 181 **Effects of random vibration on wear of fretting interface**
Zhinan ZHANG, Nian YIN, Fagang ZHAO
Shanghai Jiao Tong University, China; Shanghai Institute of Satellite Engineering, China
- 182 **Wear behavior of particles reinforced steel matrix composites**
Huahui CHEN, Yang QIN
China University of Mining and Technology, D11 Xueyuan Road, China
- 183 **Tribological behaviour of nanocellulose-reinforced wooden composites**
Rui Rosa de MORAIS JÚNIOR, Gabriel VALIM CARDOSO, Henara LILLIAN COSTA
Federal University of Rio Grande, Brazil; Federal University of Pampa, Brazil; Federal University of Pelotas, Brazil

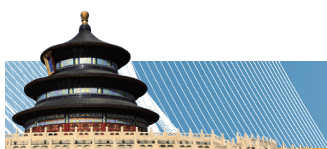


- 184 **Sliding wear of clay-based pavers with different mineralogical rock additions**
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Surface Phenomena Laboratory, Polytechnic School of the University of Sao Paulo, Brazil; Centro de Ciências Exatas e da Tecnologia, Universidade de Caxias do Sul, Brazil
- 185 **A Study of abrasive wear on high speed steel surface in hot rolling by discrete element method**
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Faculty of Engineering and Information Sciences, University of Wollongong, Australia
- 186 **Wear properties between graphene and molybdenum disulfide**
Yiming SONG, Ming MA, Li LIN, Quanshui ZHENG
Department of Mechanical Engineering, Tsinghua University, China; Center for Nano and Micro Mechanics, Tsinghua University, China; State Key Laboratory of Tribology, Tsinghua University, China; Department of Engineering Mechanics, Tsinghua University, China
- 187 **Revolute clearance joint wear in mechanical system with flexible link**
Zhengfeng BAI, Pingping WANG, Jun CHEN, Yang ZHAO
Harbin Institute of Technology, China
- 188 **The friction and wear property of bainite-martensite steel used for cutter tooth of cutter suction dredger**
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Tianjin Will Long Sci. & Tech. Co., Ltd, No.28 Hongze Rd, Xiqing Economic Development Area, Tianjin, China
- 189 **The research on welding performance of medium manganese steel in gas metal-arc welding**
Junxiang WANG, Da HU, Shuren LIU, Bin WANG
Tianjin Will Long Sci. & Tech. Co., Ltd, No.28 Hongze Rd, Xiqing Economic Development Area, Tianjin, China
- 190 **Experimental study on tribological behavior of the W-Ni-Fe alloy against SIMP steel in the different atmosphere**
Y.C. XU, X.Y. SHENG, J.Q. SUN
Tianjin research institute for advanced equipment, Tsinghua University, China; Department of Mechanical Engineering, Tsinghua University, China
- 191 **Experimental study on the delamination wear of the carbon strip in the pantograph and catenary system with electric current**
Hongjuan YANG, Lin FU, Weiwei QIAN, Guangzhu CHEN, Guangxiong CHEN
The College of Nuclear Technology and Automation Engineering, Chengdu University of Technology, Sichuan, China
- 192 **Tribological behaviours of copper mesh and flaky graphite-modified carbon/carbon composite**
Pei WANG
Central South University, No.932, Lushan South Road, Changsha City, Hunan Province, China
- 193 **Relations of counterface hardness with wear behavior and mechanism of AISI H13 steel**
Qiuyang ZHANG, Hongyan DING, Guanghong ZHOU, Lincai ZHANG, Shuqi WANG
Faculty of Mechanical and Material Engineering, Huaiyin Institute of Technology, China; School of Materials Science and Engineering, Jiangsu University, China
- 194 **Analysis of nanoscale wear for a single asperity by using atom-by-atom model**
Yunian SHEN^{1,2}
¹*Department of engineering Science, Nanjing University of Science and Technology, Nanjing, China;* ²*Department of Mechanical Engineering, University of California, Berkeley, USA*
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Mokpo National Maritime University, Korea; Division of Maritime, DNV GL, Busan, 48120, Korea
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Academy of Armored Forces Engineering, China
- 197 **Research progress of laser cladding coating on the surface of different substrate materials**
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- 198 **The research of the crack propagation in thermal spray remanufacturing products**
Feijuan WEN, Lihong DONG, Haidou WANG Yuelan DI
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- 199 **Effects of atomic oxygen erosion on the microstructure and properties of the polymeric amorphous carbon films**
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Sichuan University of Science and engineering, China
- 200 **Tribological properties of Cr₃C₂-Co coatings on 42CrMo by plasma arc welding under abrasive wear condition**
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North university of China, China; Hefei University of Technology, China
- 201 **Achieving engineering ultra-low friction: fullerene like structure hydrogenated carbon thin film**
Yongfu WANG
Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, Lanzhou 730000, China; Chinese Academy of Sciences, China
- 202 **Microstructures and properties of ZrC-SiC composite ceramic coating by thermal evaporation - in situ reaction**
Yonglong XU, Wei SUN
State key Laboratory for Powder Metallurgy, Central South University, Changsha, Hunan, China
- 203 **Effects of rare element La on microstructure and tribological behavior of niobium carbide coating on Cr12MoV steel prepared by packing method**
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Korea Institute of Materials Science (KIMS), 797 Changwondaero, Seongsangu, South Korea
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Southwest Forestry University, China; Kunming University of Science and Technology, China

- 206 **ZrB₂-SiC ceramic coating for C/C composite material microstructure and oxidation performance**
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Powder Metallurgy Research Institute, State Key Laboratory of Powder Metallurgy, Central South University, Changsha, China
- 207 **The tribological and electrochemical behavior of HVOF sprayed WC-10Co-4Cr coatings**
Sheng HONG, Yuping WU, Bo WANG, Jianfeng ZHANG, Yuan ZHENG
Hohai University, 8 Focheng West Road, Nanjing, Jiangsu, 211100, China
- 208 **Effect of 30 °C annealing on friction and wear properties of Ni-AT13 coating with different Ni content**
Ming-ming YAN, San-ming DU
Henan University of Science and Technology, 263, Kaiyuan Avenue, Luoyang, Henan, China
- 209 **Analyzation of P20 steel electro-sparking deposite Fe-base friction and wear properties**
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AECC Harbin Bearing Ltd.Co, China
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Kun SUN, Lei YANG, Dongfeng DIAO
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Hefei University of Technology, 193 TunXi Rd., Hefei, Anhui, China
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- 214 **Tribological performance of ionic liquids as lubricants of diamond like carbon coatings**
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Kielce University of Technology, Poland; Kazimierz Pulaski University of Technology and Humanities in Radom, Poland
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Anhui University of Technology, China
- 217 **Thermo-reactive diffusion (TRD) treatment of AISI 15B30 steel**
George TOTTEN, Ricardo AURELIANO, Fábio MARIANI, Amadeu LOMBARDI, Luiz CASTELETTI
Portland State University, USA; Universidade de São Paulo, Brazil; Universidade Tecnológica Federal do Paraná, Brazil
- 218 **Wear and corrosion resistance of niobium carbide layer produced in a gray cast iron by thermo-reactive treatments**
George TOTTEN, Fábio MARIANI, Carolina SOARES, Amadeu LOMBARDI, Luiz CASTELETTI
Portland State University, USA; Universidade de São Paulo, Brazil; Universidade Tecnológica Federal do Paraná, Brazil
- 219 **TRD and boriding treatments in compact (vermicular) graphite cast iron**
George TOTTEN, Fábio MARIANI, Carolina SOARES, Amadeu LOMBARDI, Luiz CASTELETTI
Portland State University, USA; Universidade de São Paulo, Brazil; Universidade Tecnológica Federal do Paraná, Brazil
- 220 **The optimization of spraying parameters of Al₂O₃ insulating coating based on orthogonal test**
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Henan University of Science and Technology, China; Collaborative Innovation Center of Machinery Equipment Advanced Manufacturing of Henan Province, China
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Hebei University of Technology, Tianjin, China
- 222 **Pulse electrodepositon of Cu-WC composite coating**
Muhammet KARTAL, Ahmet, ALP, Hatem AKBULUT
Sakarya University Esentepe Campus M7 Block Room Nb. 7006, Turkey
- 223 **Effect of various DLC coatings on the durability of AFM tips**
Chun WANG, Abdel DORGHAM, Vishal KHETAN, Anne NEVILLE
School of Mechanical Engineering, University of Leeds, UK
- 224 **Tribological studies of high velocity oxygen fuel (HVOF) superalloy coatings**
M. KANDEVA¹, D.KARASTOYANOV², ZH. KALITCHIN³, P. SVOBODA⁴
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- 225 **Tribological properties of CrN coated 20CrMo at high temperatures**
Jiliang LIU, Ridong LIAO, Guoxin XIE, Jun LUO, Bin LIAO
Beijing Institute of Technology, China; State Key Laboratory of Tribology, Tsinghua University, China; College of Nuclear Science and Technology, Beijing Normal University, China
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Pengfei LI, Hui LIU, Xianhua CHENG
Liaoning Technical University, China; Liaoning Technical University, China; Department of Mechanical Engineering, Shanghai Jiao Tong University, China
- 227 **Investigation on influence of ultrasonic stirring on mass transfer in through-mask electrochemical micromachining process**
Quandai WANG, Xingxing CAI, You LV, Li WANG, Pengyang LI, Jiming XIAO
Xi'an University of Technology, China; Xi'an Jiaotong University, China



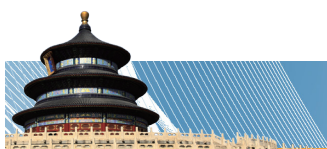
- 228 **Optimized design and experimental research on parameters of laser texturing micro-dimples on cylinder bore**
Huiqin ZHOU, Bifeng YIN, Bo XU
School of Automotive and Traffic Engineering, Jiangsu University, China
- 229 **The collision sliding contact of textured surface under micro-gravity**
Zefen QUAN, Ruiting TONG, Geng LIU
Northwestern Polytechnical University, Youyi Road, Xi'an, Shaanxi, China
- 230 **Tribological properties of laser textured surface**
Dawit Zenebe SEGU, Chengxu LU, Pyung HWANG
280 Daehak-Ro, Gyeongsan, Gyeongbuk 38541, Republic of Korea
- 231 **Deposition and tribological properties of silver based composite lubricating coatings on the textured surfaces**
Jianliang LI, Hang LI, Dangsheng XIONG, Jun WANG, Heguo ZHU
Nanjing University of Science and Technology, China
- 232 **The tribological performance of striped TiN film**
Yingqian LA
University of Science and Technology Beijing, No.30, Xueyuan Road, Haidian District, Beijing, China
- 233 **Study on high temperature friction character and properties of Ta alloying layer on M50 steel induced by high current pulsed electron beam**
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School of Materials Science and Engineering, Harbin Institute of Technology, Nangang District, Heilongjiang, China
- 234 **Macro-scale tribological properties of carbonhydrate polymer film with stearic acids as additive**
Shih-Chen SHI SHI, Yao-Qing PENG
National Cheng Kung University (NCKU), Taiwan
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- 236 **The analysis of nano scratch based on fractal surface**
Junyan ZUO, Youxi LIN, HaoSheng PANG
Fuzhou University, China
- 237 **Developing polymer brush lubrication solutions for silicon nitride hybrid contacts: from LFM to pin-on-disk**
Simon WATSON, Ling WANG, Mengyan NIE, Steve HINDER, Keith STOKES
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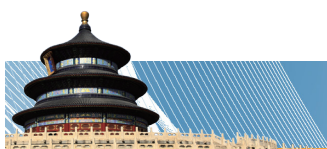
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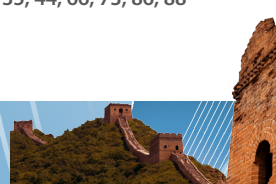


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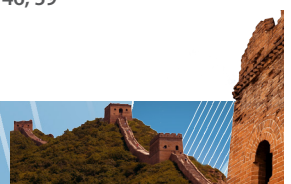
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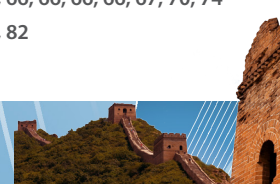
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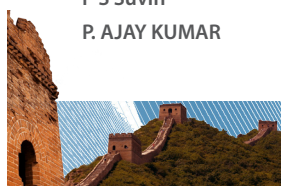
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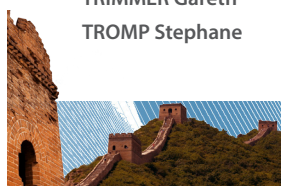
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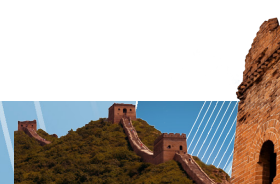
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Portable X-ray Residual Stress Analyzer

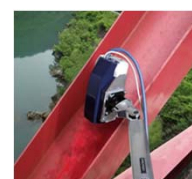
Portable X-ray Residual Stress Analyzer μ -X360s is the world's lightest and smallest residual stress analyzer. This is non-destructive measurement system for residual stress, retained austenite, FWHM based on X-ray diffraction technique, and excellent for portability, reliability, safety, operability, cost and etc.

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- * Thermal treatment. (Quenching, annealing, sub-zero treatment)
- * Surface reformation. (Shot peening, shot blasting, laser shot peening)
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Laboratory or workshop use

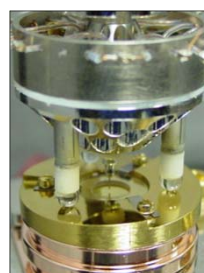
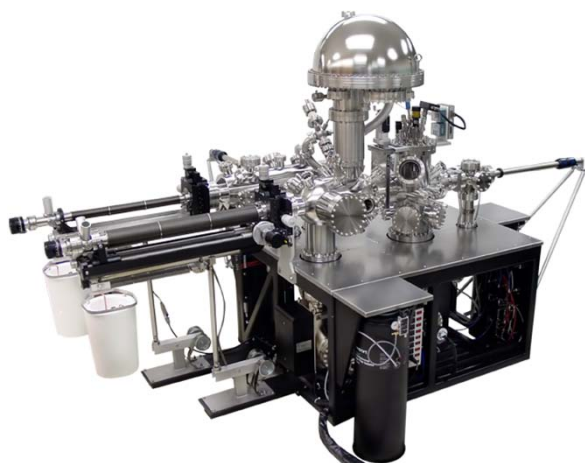


Field use

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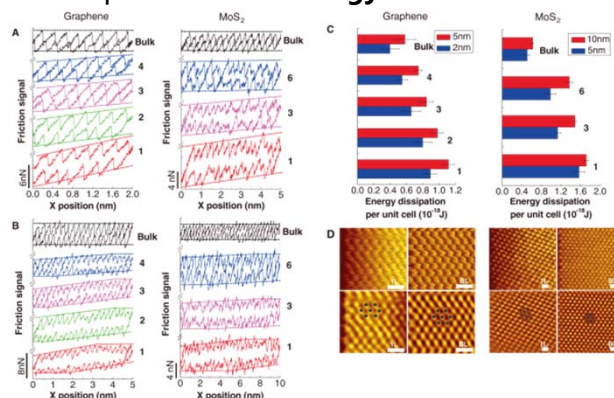
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AFM/STM Beetle scan head & Sample holder



Superb Nano-tribology characterization

- * Lowest Drift ($< 1 \text{ \AA}/\text{min}$) for Variable-Temperature Sample
- * Image 30 – 1,000 K sample temp.
- * STM + Cantilever Beam-Deflection AFM
All Modes: NC-AFM, MFM, KPFM, Contact / Conductive AFM, LFM/Friction, et al.
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 - Variable Magnetic Field
 - Microwave to tip or sample
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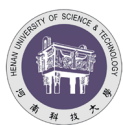
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