

PROGRAM

Sunday 13th, September

(The First day)

8:30 – 10:00

REGISTRATION

10:00-10:10

OPENING ADDRESS

K. Nakayama

Chair: H. Komiya

SESSION I

IN-SITU SURFACE ANALYSIS TECHNIQUES FOR
TRIBOCHEMISTRY

Chairs: A. Rossi & Y. Momose

10:10-10:35 (25 min)

O-01 Investigating Lubricant Degradation with Fluorescence Spectroscopy

J. Wong¹, A. Ponjavic^{1*}, J. Dench¹, and B. Galmiche¹ (¹ *Imperial College London*, ^{*} *Current Address: University of Cambridge*)

10:35-11:00 (25 min)

O-02 Cross-Sectional Imaging of Adsorbed Additive Layer and Its Shear Property in Narrow Gap

T. Hirayama^{1, 2}, K. Fujino¹, S. Shibata¹, T. Matsuoka¹ and H. Komiya¹
(¹ *Doshisha University, Japan*, ² *JST Presto, Japan*)

SESSION II ACTIVE SPECIES TO CAUSE TRIBOCHEMISTRY AND
SUPERLUBRICITY-CHEMISTRY OF DLC-COATINGS

Chairs: J. Fontaine & H. Komiya

11:00-11:25 (25 min)

**O-03 Distributions and Numbers of the Radicals and Ions Produced in
Triboplasma as Active Species to Cause Tribochemical Reactions.**

K. Nakayama¹ and M. Tanaka² (¹ *Institute of Mesotechnology, Japan*, ² *PEGASUS
Software Inc., Japan*)

11:25-11:50 (25 min)

O-04 Tribochemistry of DLC Coatings Lubricated by Oleic Acid

J. M. Martin¹, M.I. De B. Bouchet¹, K. Yoshida² and M. Kano² (¹ *Ecole Centrale
de Lyon, France*. ² *Kanagawa Industrial Technology Center, Japan.*)

< **Lunch (70 min)** >

SESSION III ADVANCED SURFACE ANALYSIS TECHNIQUES FOR
TRIBOCHEMISTRY

Chairs: M. Kalin & N. Suzuki

13:00-13:25 (25 min)

O-05 Tribochemical Aspects of Mechanical Mixing in Tribological Contacts

M. Dienwiebel¹², P. Stoyanov¹², P.A. Romero¹², R. Merz³, P. Stemmer⁴
and M. Moseler¹² (¹ *Karlsruhe Institute of Technology, Germany*, ² *Fraunhofer
IWM, Freiburg, Germany*, ³ *IFOS GmbH, Germany*, ⁴ *University
Duisburg-Essen, Germany*, ⁵ *University of Freiburg, Germany*)

13:25-13:50 (25 min)

**O-06 Surface Analysis Techniques in Tribocorrosion Studies
of Multiphase Alloys**

G. Stachowiak¹, M. Salasi¹ and G. Stachowiak¹ (¹ *Curtin University, Australia*)

SESSION IV TRIBOCHEMISTRY OF CHARGED INTERFACES AND IONIC LIQUIDS

Chairs: G. Stachowiak & K. Hiratsuka

13:50-14:15 (25 min)

O-07 Friction and Adhesion at Liquid/Solid Interfaces

I. Szlufarska¹, K. Huang¹ (¹ *University of Wisconsin, USA*)

14:15-14:40 (25 min)

O-08 Counterion Condensation and Dynamics on the Surfaces

H. Washizu^{1,2}, T. Kinjo^{1,2} and H. Yoshida^{1,2} (¹ *Toyota Central R&D Labs., Japan*, ² *Kyoto University, Japan*)

14:40-15:05 (25 min)

O-09 On the Tribochemistry of Ionic Liquids as Lubricants

A. Rossi^{1,2}, P. Baumli², L. Collu¹, A. Arcifa², R. M. Espinosa-Marzal^{2,3}, and N.D. Spencer² (¹ *Università di Cagliari, Italy*, ² *ETH Zurich, Switzerland*, ³ *University of Illinois at Urbana-Champaign, USA*)

< **Tea Break (20 min)** >

SESSION V TRIBOCHEMISTRY OF NANO-FIBERS AND NANO-BRUSHES

Chairs: R. Waesche & T. Hirayama

15:25-15:50 (25 min)

O-10 Development of High Friction Cellulose through Surface Modifications

R. Crockett¹, S. Roos¹ and S. Josset¹ (¹ *Swiss Federal Institute for Materials Research and Technology (Empa), Switzerland*)

15:50-16:15 (25 min)

O-11 Mechanical and Tribological Properties of Polymer Brushes and Brush-Gels

N.D. Spencer¹ (¹ *ETH Zürich, Switzerland*)

SESSION VI TRIBOCHEMISTRY OF FM AND EP ADDITIVES IN GAS PHASE
LUBRICATION

Chairs: V. Raman & T. Yoshinari

16:15-16:40 (25 min)

**O-12 Tribochemistry of Phosphorus and Sulfur-based Additives using Gas
Phase Lubrication**

M. I. De B. Bouchet¹, S. Mamingo-Doumbe², T. Le-Mogne¹, A. Bouffet² and
J.M. Martin¹ (¹ECL, France, ²Total, France)

16:40-17:05 (25 min)

O-13 Shear-Induced Effects in Boundary Film Formation on Copper

W.T. Tysoe¹, M. Garvey¹ and A. Martini² (¹University of Wisconsin Milwaukee,
USA, ²University of California Merced, USA)

SESSION VII TRIBOCHEMISTRY OF NASCENT SURFACES AND CATALYTIC
ACTIONS

Chairs: W.T. Tysoe & K. Sasaki

17:05-17:30 (25 min)

O-14 Tribocatalysis of Palladium in the Oxidation of Ethylene

Ken'ichi Hiratsuka¹ and Shota Fujiya¹ (¹Chiba Institute of Technology, Japan)

17:30-17:55 (25 min)

O-15 Tribochemistry on Nascent Surfaces

S. Mori¹, H. Nanao¹, R. Lu¹, K. Takiwatari², N. Shimotomai³ and T. Konno³
(¹Iwate University, Japan, ²National Institute of Technology, Japan, ³Kyodoyushi
Co. Ltd., Japan)

Announcement from the Executive Committee

<Break (65 min.) >

19:00-21:00

WELCOMING RECEPTION
(2 hours)

Monday 14th, September

(The Second day)

SESSION VIII TRIBOCHEMISTRY IN DLC COATINGS

Chairs: J.M. Martin & S. Loehle

08:30-08:55 (25 min)

O-16 Ceramics and DLC – Influence of Tribochemistry on Sliding under Lubricated Conditions at Elevated Temperatures

R. Waesche¹ and M. Hartelt¹ (¹Federal Institute for Materials Research and Testing (BAM)), Germany)

08:55-09:20 (25 min)

O-17 Tribochemical Effect of Environment on Silicon Oxide-Doped Hydrogenated Amorphous Carbon Coatings

K.D. Koshigan¹, F. Mangolini¹, J.B. McClimon², R.W. Carpick² and J. Fontaine¹, (¹Ecole Centrale de Lyon, France, ²Univ. of Pennsylvania)

09:20-9:45 (25 min)

O-18 In Situ Analysis of Structural Changes of DLC During Friction by using Newly Developed Observation System

K. Sasaki¹, N. Kida¹ and N. Inayoshi¹ (¹Material Eng. R&D Div., DENSO CORPORATION, Japan)

< Tea Break (20 min) >

SESSION IX TRIBOCHEMISTRY IN HDI AND DLC COATINGS

Chairs: N.D. Spencer & S. Mori

10:05-10:30 (25min)

**O-19 Lubricant Mediated Smear Formation in Magnetic Recording
Head-Disk Interfaces**

V. Raman¹, T. Nguyen¹ and J. Escobar¹ (¹*Hitachi Global Storage Technologies,
U.S.A*)

10:30-10:55 (25 min)

O-20 The Adsorption of Lubricants and Additives on DLC Coatings

M. Kalin¹ and R. Simič¹ (¹*University of Ljubljana, Slovenia*)

SESSION X TRIBOCHEMISTRY IN MOS₂ AND GRAPHENE

- EXPERIMENT AND SIMULATION -

Chairs: M. Moseler & I. Szlufarska

10:55-11:20 (25 min)

**O-21 Contact, Indentation, and Scratching of a Graphene-Covered
Metal Surface**

A. Klemenz¹, S. G. Balakrishna², A. Caron², R. Bennewitz², P. Gumbsch^{1,3}, M.
Moseler¹, L. Pastewka^{1,3} (¹*Fraunhofer IWM, Germany*; ²*INM – Leibniz
Institute for New Materials, Germany*; ³*Karlsruhe Institute of Technology,
Institute for Applied Materials, Germany*)

11:20-11:45 (25 min)

O-22 *Ab initio* description of tribochemistry processes in lubrication

M. C. Righi¹ (¹*CNR-Institute of Nanoscience, Italy*)

Announcement from the Executive Committee

11:45 – 12:50

< **Lunch** (65 min) >

12:50 - 13:00

MEMORIAL PICTURE

13:00 - 15:00

POSTER SESSION
(120 min)

< **Break** (30 min.) >

15:30-17:20

SOCIAL TOUR –THE TOSHOGU SHRINE-
(90 ~110 min.)

① Hotel Senhimemonogatari Departure 15:30 →②Five Storied Pagoda
→③Carving of Three Monkeys→④Roaring Dragon→⑤Yomeimon
Gate→⑥Hall of Worship→Wooden Prayer Board of Sleeping Cat →
(⑧ Tomb of Ieyasu Tokugawa: no guide, as free (unorganized)
activities: 20 min) → Hotel Senhimemonogatari Arrive 17:00
(Standard course), 17:20 (Free activity course including ⑧)

< **Break** (100 min.) >

19:00-21:00

BANQUET
(2 hours)

Tuesday 15th, September

(The Third day)

SESSION XI SIMULATION OF TRIBOCHEMISTRY ON DLC FILM
- ACTION OF H₂O MOLECULES –

Chairs: A. Miyamoto & M.I.De Barros Bouchet

08:30-8:55 (25 min)

O-23 Effects of Silicon Dopants on Water Tribochemistry at Diamond-like Carbon Interfaces by *Ab initio* Molecular Dynamics

S. Kajita^{1,2} and M. C. Righi² (¹ Toyota Central R&D Labs., Japan; ² Istituto Nanoscienze, CNR-Consiglio Nazionale delle Ricerche, Italy)

08:55-9:20 (25 min)

O-24 Tribo-chemical Reaction on Diamond-like Carbon Film in Water : A Computational Simulation Study

S. Bai¹, Y. Niiyama¹, Y. Kobayashi¹, Y. Higuchi¹, N. Ozawa¹, K. Adachi¹, S. Mori¹, K. Kurihara¹, and M. Kubo¹ (¹ Tohoku University, Japan)

SESSION XII SIMULATION OF TRIBOCHEMISTRY AND THE APPLICATIONS

Chairs: M. Kubo & R. Crockett

09:20-9:45 (25 min)

O-25 Tribologically Induced Amorphization of Silicon

G. Moras¹, A. Klemenz¹, H. Uetsuka², M. Moseler¹ and L. Pastewka^{1,3} (¹ Fraunhofer IWM, Germany, ²Asahi Diamond Co., Ltd., Japan, ³Karlsruhe Institute of Technology, Germany)

9:45-10:10 (25 min)

O-26 Atomistic Simulations of Tribo-induced Phase Transitions

M. Moseler¹ (¹ Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany)

10:10-10:35 (25 min)

**O-27 Role of Ultra-Accelerated Quantum Chemical Molecular Dynamics
in Multiscale, Multiphysics Simulation for Tribochemical
Applications**

A. Miyamoto¹, P. Bonnaud¹, R. Miura¹, A. Suzuki¹, N. Miyamoto¹, N.
Hatakeyama¹, S. Kozawa¹, and M.C. Williams¹ (¹ *Tohoku University, Japan*)

10:35-10:45 **CLOSING REMARKS**

K. Nakayama

Chair: H. Komiya

< **Break** (45 min.) >

11:30-16:20

SOCIAL TOUR –THE GREAT NATURE–

(About 5 hours)

(Lunch in the bus)

- ① **Hotel Senhimemonogatari** 11:30 (Depart.) → <Through Iroha Slopes (up, *Lunch in bus*)> → ② **Akechidaira** 11:55 (Arrive), 15 min break, 12:10 (Depart.) → ③ **Kegon Falls** 12:15 (Arrive), 45 min. break, 13 : 00 (Depart) → ④ **Ryuzu Falls** 13:15 (Arrive), 20 min walk up, 13:35 (Depart) → ⑤ **Sanbonmatsu in Senjogahara plateau** 13:50 (Arrive), 20 min. break, 14:10 (Depart) → ⑥ **Yutaki Falls** 14:20 (Arrive)), 20 min. break, 14:40 (Depart) → ⑦ **Lake Yunoko** 14:50 (Arrive and Depart), walk to Spring head 10 min. → ⑧ **Spring Head** 15:00 (Arrive), 20 min. break, 15:20 (Depart) → ⑨ **Lake Yunoko** 15:30 (Arrive), 20 min. break, 15:50 (Depart) → Iroha Slopes (down) → ⑩ **JR Nikko Station and then Tobu Nikko-Station** 16:20 (Arrive)

Attention!

The bus may come back to the Nikko station behind the scheduled time of 16:20, because sometimes traffic jam happens.

POSTER SESSION

Monday 14th, September

(The Second Day)

<13:00-15:00>

P-01 Tribochemical Wear Mechanism of Polytetrafluoroethylene

T. Onodera¹, K. Kawasaki¹, T. Nakakawaji¹, Y. Higuchi², N. Ozawa², K. Kurihara², and M. Kubo² (¹*Hitachi, Ltd., Hitachi Research Laboratory, Japan;* ²*Tohoku University, Japan*)

P-02 A Lubrication Life Mechanism and Life Extension for Fluorinated Grease in Bearing

Y. Imai¹ (¹*Kyodoyushi Co.,Ltd., Japan*)

P-03 A Theoretical Investigation on Tribochemistry by Molecular Dynamics Method

R. Ashizawa¹ and T. Onodera¹ (¹*Hitachi, Ltd., Japan*)

P-04 Damage Quantification of an Extremely-thin Lubricant Coated Magnetic Disk at High Temperature

S. Suzuki¹ and S. Miyake¹ (¹*Nippon Institute of Technology, Japan*)

P-05 A Theoretical Investigation at Atomic-Scale Degradation of Diamond-Like Carbon Coatings Induced by Stress during Friction

Y. Wang¹, T. Tsuruda¹, H. Murabayashi¹, Y. Kobayashi¹, S. Bai¹, Y. Higuchi¹, N. Ozawa², K. Adachi¹, J.M. Martin² and M. Kubo¹ (¹*Tohoku University, Japan,*

²*Ecole Centrale de Lyon, France*)

P-06 Coarse-Grained Simulation on the Wear Mechanism of Polymer Brush

R. Takakuwa¹, Y. Higuchi¹, N. Ozawa¹, Y. Tsujii³, K. Kurihara¹, and M. Kubo¹
(¹*Tohoku University, Japan*)

P-07 Tribological System Modeling at Mesoscopic Scale to Study the Behavior of Lubricants

S. Berkani^{1,2}, S. Loehle¹, K. Okushi², N. Hatakeyama² and A. Miyamoto² (¹*TOTAL M&S – CRES, France*, ²*NICHE, Tohoku University, Japan*)

P-08 Tribochemical Reactions of Imidazolium-Based Ionic Liquids Used as Lubricants for Silica / Silicon Tribopairs

A. Arcifa¹, A. Rossi^{1,2}, R. M. Espinosa-Marzal^{1,3}, N.D. Spencer¹ (¹*ETH Zurich, CH-8093 Zurich, Switzerland*, ²*Università di Cagliari, Italy*, ³*University of Illinois at Urbana-Champaign, USA*)

P-09 Tribological Properties of Boron Oxide and Zinc Borate Glasses

F. Spadaro¹, A. Rossi^{1,2}, E. Iainé³, P. Woodward³ and N.D. Spencer¹ (¹*ETH Zurich, Switzerland*, ²*Università degli Studi di Cagliari, Italy*, ³*Infineum UK Ltd, UK*)

P-10 Influence of Oxidation of MoS₂ Layers Sandwiched between Diamond-like Carbon Films on Their Friction Property by Computational Simulation

H. Murabayashi¹, T. Tsuruda¹, Y. Wang¹, Y. Kobayashi², S. Bai¹, Y. Higuchi¹, N. Ozawa¹, K. Adachi¹, J.M. Martin², and M. Kubo¹ (¹*Tohoku University, Japan*, ²*Ecole Centrale de Lyon, France*)

P-11 Effect of DLC Film Structures on Friction Property by Quantum Chemical Molecular Dynamics Simulation

T. Tsuruda¹, H. Murabashi¹, Y. Wang¹, Y. Kobayashi¹, T. Kuwahara¹, S. Bai¹, Y. Higuchi¹, N. Ozawa¹, K. Adachi¹, J.M. Martin², and M. Kubo¹ (¹Tohoku University, Japan, ⁴Ecole Centrale de Lyon, France)

P-12 Influence of Oxide Overlayer on Photoemission from Scratched Real Iron Surfaces

Y. Momose¹, K. Tsuruya¹, T. Sakurai² and K. Nakayama³ (¹Ibaraki University, Japan ²Ashikaga Institute of Technology, Japan, ³Institute of Mesotechnology, Japan)

P-13 Application of Ionic liquids into Space Lubricants

M. Hayama¹ (¹Kyodoyushi.Co.,Ltd., Japan)

P-14 Thermally Assisted Photoemission Analysis of Scratched Real Iron Surfaces

T. Sakurai¹, Y. Momose², K. Tsuruya² and K. Nakayama³ (¹Ashikaga Institute of Technology, Japan, ²Ibaraki University, Japan, ³Institute of Mesotechnology, Japan)

P-15 Corrosive Wear Mechanism of Methanol Blended Gasoline

K. Yoshida¹, S. Tachikawa¹ and N. Inayoshi¹ (¹DENSO CORPORATION, Japan)

P-16 Study on the Friction-Reduction Properties of Fatty Acids and the Adsorption Structures of their Langmuir-Blodgett Monolayers Using Sum Frequency Generation Spectroscopy and Atomic Force Microscopy

Y. Iyotani¹, H. Koshima¹, Q. Peng² and S. Ye² (¹Idemitsu Kosan Co. Ltd., Japan, ²Hokkaido University, Japan)

- P-17 Evaluation of Energy Saving Hydraulic Fluid by Roller on Disk Test**
Y. Takeuchi¹, and M. Otsuka² (*Japan Lubricating Oil Society, 2-16-1, Japan*)
- P-18 Tribological Characteristics of Organo-Bismuth Compounds as Antiwear and Extreme Pressure Additive for Lubricants**
K. Yoshizaki¹, M. Suzuki¹, H. Iwamatsu² and Y. Matano³ (¹*JTEKT CORPORATION, Japan*, ²*Nippon Grease Co., Ltd., Japan*, ³*Niigata University, Japan*)
- P-19 Microtribological Properties of Boundary Lubrication Layer Evaluated by Colloidal-Probe Atomic Force Microscopy**
T. Kiriya¹, T. Hirayama^{1,2}, T. Matsuoka¹, H. Komiya¹, N. Yamashita¹ and Y. Tsujii³ (¹*Doshisha University, Japan*, ²*JST Presto, Japan*, ³*Kyoto University, Japan*)
- P-20 Au and Pt Nanoparticle Solution Applying to Sliding Surface**
T. Maeda¹, T. Hirayama^{1,2}, T. Matsuoka¹ and H. Komiya¹ (¹*Doshisha University, Japan*, ²*JST Presto, Japan*)
- P-21 Friction Reduction Mechanism by Block Polymer Additive**
H. Kawabata¹, T. Hirayama^{1,2}, T. Matsuoka¹, H. Komiya¹ and Y. Tsujii³
(¹*Doshisha University, 1-3 Miyakodani, Tatara, Kyotanabe, Kyoto, Japan*, ²*JST Presto, 4-1-8 Honcho, Kawaguchi, Saitama, Japan*, ³*Kyoto University, Gokasho, Uji, Kyoto, Japan*)
- P-22 Condition Monitoring Method for Driving Equipment of Railway Vehicle Using On-line Analytical Sensor of Lubricating Oil**
J. Suzumura¹, S. Kikawa¹ and S. Manabe¹ (¹*Railway Technical Research Institute, 2-8-38 Hikari-cho Kokubunji-shi, Tokyo, JAPAN*)

P-23 Triboemission Imaging

Alessandra Ciniero¹, Julian Le Rouzic² and Tom Reddyhoff¹ (¹ *Imperial College, UK,* ² *Universite de Poitiers, France*)