

Technical Program

Thursday, April 25 9:15-10:35 Room E (Emerald)

Plenary Lecture 1, 2 Chair : Sang Won Lee (Sungkyunkwan University, Korea).

PL-1 In-situ observation of friction surface with reflectance spectroscopy

Noritsugu Umehara

Nagoya University, Japan

PL-2 Highly Efficient Machining of Digital image on the Mold Surface using an Electromagnetically Suspended Air spindle

Sun-kyu Lee

Gwangju institute of Science and Technology, Korea

Friday, April 26 9:00-10:20 Room E (Emerald)

Plenary Lecture 3, 4 Chair : Kenjiro Takemura (Keio University, Japan)

PL-3 How fast a world changes!

Soo-Hong Lee

Yonsei University, Korea

PL-4 Extreme Human Centered Engineering

Ken Endo

Xiborg Inc., Japan, Sony Computer Science Laboratories, Inc., Japan

Thursday, April 25 10:50-12:20 Room A (Pearl)

Printing Technology for Manufacturing(1) Chair : Motoyuki Murashima, Nagoya University, Japan

TH-A-1-1 Preparation of an RMS (Ready-Made STL) model for metal 3-D Printing

Haeseong Jee, Myoung-Gyu Kim

Hongik University, Korea

TH-A-1-2 Biomedical research and applications with optical microfluidic system & novel 3D additive manufacturing

Yong-Jin Yoon, Suhan Lee, Jinhong Noh, Yoseop Choi

Korea Advanced Institute of Science and Technology, Korea

TH-A-1-3 A geometric property of melt-electrowritten microfiber structures

Young Hun Jeong, Nhat Tung Nguyen

Kyungpook National University, Korea

TH-A-1-4 Process Parameter Identification to Improve the Printed Line Quality in Aerosol Jet Printing

Seung Ki Moon*, Haining Zhang*, Zhong Yang Chua*, Byunghoon Lee**, Jamyong Koo**

**Nanyang Technological University, Singapore, **Samsung Electronics Co., Ltd., Korea*

TH-A-1-5 Mechanical properties validation of multiple inner lattice structures using effective elastic properties

Ho seung Jeong, Sang Hu Park, Dong Seok Kang, Qingye Jin

Pusan National University, Korea

Printing Technology for Manufacturing(2) Chair : Haeseong Jee, Hongik University, Korea

- TH-A-2-3 Lightweight Design of Multi-Lattice Structures and Evaluation of Its Mechanical Properties by Quarter Compression Test**
Qingye Jin, Sang Hu Park, Dong Seok Kang, Ho seung Jeong
Pusan National University, Korea
- TH-A-2-4 Tribological properties of novel 3D micro-textured sliding-surface fabricated by metal 3D printer**
Naohide Matsuoka, Hiroaki Maeda, Kenta Takahashi, Shinya Sasaki
Tokyo University of Science, Japan
- TH-A-2-5 Design of a trawl door with adaptively controllable flap imitated from a bird's wing**
Ji Won Lee*, Hong Keun Yoon**, Yeon Ju Park**, Sang Hu Park*
**Pusan National University, Korea, **Bminternational Co.,Ltd., Korea*
- FR-A-1-6 Indices for tool wear monitoring in CFRP drilling**
Kyeong Bin Kim, Young Hun Jeong
Kyungpook National University, Korea

Injection Molding Chair : Yong-Jin Yoon, Korea Advanced Institute of Science and Technology, Korea

- TH-A-3-1 High-frequency induction heating for polymer/metal hybrid molding**
Keun Park, Hyun Joong Lee
Seoul National University of Science and Technology, Korea
- TH-A-3-2 Correlation between demolding force and physical property of molded resin in injection molding**
Kazuyoshi Oota*, Wataru Natsu*, Masayuki Okabe**, Yuya Aihoshi**, Misato Nagasawa***
Tokyo University of Agriculture and Technology, Japan, **Polytechnic University, Japan, *Sanden Advanced Technology Corp., Japan*
- TH-A-3-3 Temperature distribution of mold and molded product and its influence on demolding force in injection molding process**
Haruki Nakamura, Kazuyoshi Oota, Wataru Natsu
Tokyo University of Agriculture and Technology, Japan
- TH-A-3-4 Optimization of mold temperature profile and process parameters for minimizing weldline and cycle time in rapid heating cycle molding**
Ryoto Ishizuki*, Satoshi Kitayama*, Masahiro Takano**, Yoshikazu Kubo***, Shuji Aiba***
Kanazawa University, Japan, **Machinery and Metal, Industrial Research Institute of Ishikawa, Japan, *Sodick Co., Ltd., Japan*
- TH-A-3-5 Optimization of variable injection velocity for weldline reduction in plastic injection molding**
Sara Hashimoto*, Satoshi Kitayama*, Masahiro Takano**, Yoshikazu Kubo***, Shuji Aiba***
Kanazawa University, Japan, **Machinery and Metal, Industrial Research Institute of Ishikawa, Japan, *Sodick Co., Ltd., Japan*
- TH-A-3-6 Development of a continuous roll molding system with a vitreous carbon roll mold**
Jun Kim, Muhammad Refatul Haq, Young kyu Kim, Seok min Kim
Chung Ang University, Korea

Machine Elements(1) Chair : Yasuyoshi Tozaki, Kindai University, Japan

- TH-B-1-1 Effects of oil film behavior on roller surface on cooling in traction drives**
Naoki Muraoka
Tokai University, Japan
- TH-B-1-2 Investigation of transient response of differential planetary gear train during reverse rotation via high-speed camera monitoring**
Tomoki Fukuda, Masao Nakagawa, Seiya Hamada, Toshiki Hirogaki, Eiichi Aoyama
Doshisha University, Japan
- TH-B-1-3 Study on Supply Direction of Lubricating Oil by Using CFD Analysis in Traction Drive**
Masayuki Ochiai, Takuya Suwa, Hiromu Hashimoto
Tokai University, Japan
- TH-B-1-4 Optimization of the pin shape to minimize power loss of chain for continuously variable transmission (CVT)**
Teruhiko Nakazawa*, Haruhiro Hattori*, Ichiro Tarutani*, Shinji Yasuhara**, Tsuyoshi Inoue***
Toyota Central R&D Labs., Inc., Japan, **JTEKT Corp., Japan, *Nagoya University, Japan*
- TH-B-1-6 Modeling Methodology for Dynamic Characteristics Analysis of Multi-Axis Feed Drive Systems Including Rotating Units**
SeoJun Hong, Myeong Yeon Park, Jay-Il Jeong
Kookmin University, Korea

Thursday, April 25 13:30-15:00 Room B(Cattleya)

Machine Elements(2) Chair : Hidetaka Koga, ISUZU Motors Ltd., Japan

- TH-B-2-1 Influence of Trochoidal Interference near Base Circle of Helical Gear on Pitting Failure**
Koji Kumagai*, Kunihiro Morikawa*, Atsushi Hayata*, Yuta Naito*, Syuhei Kurokawa**,
**Nissan Motor Co., Ltd., Japan, **Kyusyu University, Japan*
- TH-B-2-2 Evaluating the multi-thread-worm and helical gear for a walking assistance device**
Yohsiki Yamamoto, Kazuki Osawa, Eiichiro Tanaka
Waseda University, Japan
- TH-B-2-3 Networks of tooth helix deviations of hobbed, grinded and super-finished gears**
Hiroki Inoue*, Daisuke Iba*, Hidekatsu Noda*, Myungsoo Kim**, Ichiro Moriwaki*
**Kyoto Institute of Technology, Japan, **Osaka seimitsu kikai, Japan*
- TH-B-2-4 Influence of meshing positions and case-carburizing of gear side surfaces on bending fatigue strength of case-carburized helical gears with large helix angles**
Mikiya Yamaoka*, Motomu Tanaka*, Masaya Kumada*, Kengo Nojima**, Ryosuke Nishi*, Yuichi Ono*, Takao Koide*
**Tottori University, Japan, **Tottori Institute of Industrial Technology, Japan*
- TH-B-2-5 Study on surface temperature evaluation method of hardened helical gear with lengthwise sliding velocity**
Tomoaki Nara, Yasuyoshi Tozaki, Takuya Goto, Ryota Hosaka
Kindai University, Japan

TH-B-2-6 Hobbing-Machine-Diagnosis System with Artificial Intelligence: Hobbing Simulation for Learning

Data

Kunitoshi Kawano*, Daisuke Iba**, Kouichirou Uriu*, Ichiro Moriwaki**

**Kashifuji Works, Ltd., Japan, **Kyoto Institute of Technology, Japan*

Thursday, April 25 16:45-18:15 Room B(Cattleya)

Machine Elements(3) Chair : Takao Koide, Tottori University, Japan

TH-B-3-1 Study on tooth profile measurement using contour shape measuring instrument

Ryohei Ishimaru, Naoshi Izumi

National Institute of Technology, Kurume College, Japan

TH-B-3-2 Robustness evaluation of vibration-based gear crack detection system using a convolutional neural network

Kien Huy Bui, Daisuke Iba, Yunosuke Ishii, Yusuke Tsutsui, Nanako Miura, Takashi Iizuka, Arata Masuda, Akira Sone, Ichiro Moriwaki

Kyoto Institute of Technology, Japan

TH-B-3-3 Development of In-Situ Portable Gear Damage Diagnostic System Using Laser Reflection

Chinn Yee Lim*, Jyun-Rong Zhuang*, Masahiro Yasuda**, Kikuno Furuta**, Fumitake Kida**, Masakazu Nakasako***, Kiyotaka Ikejo****, Eiichiro Tanaka*

Waseda University, Japan, **Kokura Tetsudo Co., Ltd., Japan, *National Institute of Technology, Kure College, Japan, ****Hiroshima Univeristy, Japan*

TH-B-3-4 Evaluation of Printed Crack Detection Sensors by Static Load and Endurance Test of Gears

Yusuke Matsushita, Daisuke Iba, Shintaro Fuatagawa, Nanako Miura, Takashi Izuka, Arata Masuda, Akira Sone, Ichiro Moriwaki

Kyoto Institute of Technology, Japan

TH-B-3-5 Proposal of Machining Mark Model for Gear Tooth Surface Using Slices of Two-Dimensional Spectrum

Junichi Hongu, Hiroki Noborio, Takao Koide, Atsutaka Tamura

Tottori University, Japan

Thursday, April 25 10:50-12:20 Room C(Orchid)

Machine Design(1) Chair : Yoshihiro Kai, Tokai University, Japan

TH-C-1-1 Modeling and Control System Design of Self-Standable Motorcycle

Susumu Hara, Koki Nakagami

Nagoya University, Japan

TH-C-1-3 Development of the Walking Assistive Device Able to Walk on Stairs Using Zero-Moment Point Control Method

Bo Rong Yang, Hee Hyol Lee, Eiichiro Tanaka

Waseda University, Japan

TH-C-1-4 A 3Dimensional ball rotating control system with active-casters

Shunsuke Inui, Masayoshi Wada

Tokyo University of Agriculture and Technology, Japan

TH-C-1-5 Research on Enhancing Stiffness of a Micro Blade

Daeyoung Ji*, Kang Soo Lee*, Jung Su Mun**

*Hanbat National University, Korea, **I. D. T. Ltd., Korea

TH-C-1-6 Displacement analysis of a 3-DOF parallel mechanism for thumb rehabilitation

Woo-hyeok Choi, Yukio Takeda

Tokyo Institute of Technology, Japan

Thursday, April 25 13:30-15:00 Room C(Orchid)

Machine Design(2) Chair : Eiichiro Tanaka, Waseda University, Japan

TH-C-2-1 Study on design of linear motion-rotational motion transformer using a double eccentric crank

Jun Nango, Hiroto Anbe, Kouhei Murakami

Yamagata University, Japan

TH-C-2-3 Cylinder-shaped robot with symmetric stretching mechanism by using eight directional bars

Takeshi Okuno*, Geunho Lee*, Chulmin Kwon**

*University of Miyazaki, Japan, **Korea Evaluation Institute of Industrial Technology, Korea

TH-C-2-5 Compact root-vegetable harvesting assist robot capable of using with standing posture

Shousuke Hamada, Ishimoto Atsushi, Lee Geunho

University of Miyazaki, Japan

TH-C-2-6 Specification Design of Sea-water High Pressure Piston Pump for Scientific Submarine in Deep Sea

Mojiz Abbas Trimzi*, Young-Bog Ham**, Jung-Ho Park**, So-Nam Yun**, Yong-Gil Kim***, Dang-Ju Kim***, Ho-Yeon Son***, Pan-Mook Lee****

*University of Science & Technology, Korea, **Korea Institute of Machinery and Materials, Korea,

Daiho Hydraulic Co. Ltd., Korea, *Maritime and Ocean Engineering Research Institute, Korea

Thursday, April 25 16:45-18:15 Room C(Orchid)

Machine Design(3) Chair : Jun Nango, Yamagata University, Japan

TH-C-3-1 Case study: Effectiveness of a sketch learning model for engineering major students

Seongwon Jeong

Seoul National University of Science and Technology, Korea

TH-C-3-2 A Flexibly Grasping and Manipulating Mechanism Composed of Many Elastic Cords

Naoto Kondoh, Nobuyuki Iwatsuki, Ikuma Ikeda, Nozomu Miyata

Tokyo Institute of Technology, Japan

TH-C-3-4 Development of an upper-limb assistance device based on the predictable motion recognition system

Hao Yang, Yun-Ting Liao, Hee-Hyol Lee, Eiichiro Tanaka

Waseda University, Japan

TH-C-3-5 Design optimization of redundantly planar parallel kinematic mechanism for performing finish cut to improve surface roughness of FDM 3D printed sculptures

Donghun Lee, Minbok Lee

Soongsil University, Korea

Thursday, April 25 10:50-12:20 Room D(Rose)

Actuator Systems (1) Chair : Kenjiro Takemura, Keio University, Japan

TH-D-1-1 Fabrication process of a McKibben artificial muscle with SMP fibers by a braider machine

Koya Matsushita, Shuichi Wakimoto, Shigeyoshi Yahara, Takefumi Kanda

Okayama University, Japan

TH-D-1-2 Evaluation of a small three-way valve driven by a single piezoelectric vibrator for hydraulic actuator system

Hikaru Yamamoto*, Takefumi Kanda*, Syuichi Wakimoto*, Kou Hashimoto*, Haruto Takami*, Norihisa Seno**, Koichi Suzumori**, Takahiro Ukida**, Hiroyuki Nabae**

**Okayama University, Japan, **Tokyo Institute of Technology, Japan*

TH-D-1-3 A Study on an In-Pipe Mobile Micromachine Having a Fluid Inertia Micropump

Yuki Tamanoi, Ryota Horai, Kazuhiro Yoshida, Sang In Eom, Joon-wan Kim

Tokyo Institute of Technology, Japan

TH-D-1-4 Controlling electro-spray-deposited pattern by changing electrical field on a stencil mask

Khoa Nhat Dang Nguyen, Kazuhiro Yoshida, Joon-Wan Kim

Tokyo Institute of Technology, Japan

TH-D-1-5 Development of Mobile Pneumatic Assist Wear System for Preventing Fall Accidents from Wheel Chairs

Makoto Takada*, Kan Ishida*, Shuichi Wakimoto*, Takeji Ueda**, Takefumi Kanda*

**Okayama University, Japan, **Energyfront Ltd., Japan*

TH-D-1-6 Development of pneumatic finger-wrist extension rehabilitation device

Yasuko Matsui, Daiki Hosomi, Masahiro Takaiwa

Tokushima University, Japan

Thursday, April 25 13:30-15:00 Room D(Rose)

Actuator Systems (2) Chair : Joonwan Kim, Tokyo Institute of Technology, Japan

TH-D-2-1 Development of a lightweight jumping unit using SMA actuators for a small lunar rover

Tomoki Hirota*, Hironari Taniguchi*, Masato Tanaka**

**Osaka Institute of Technology, Japan, **Astro Technology SOHLA, Japan*

TH-D-2-2 Development of an Externally Powered Prosthetic Hand for Children Using Miniature McKibben Soft Actuators

Nobuo Takemoto*, Hironari Taniguchi*, Shuichi Wakimoto**, Kouyou Asano**, Kousuke Morinaga***, Takehumi Kanda**

**Osaka Institute of Technology, Japan, **Okayama University, Japan,*

****Hiroshima International University, Japan*

TH-D-2-3 Formulation of Tactile Gestalt to Express Variation in Velvet Hand Illusion Caused by Out-of-Phase Cycles of Two Wires

Masahiro Ohka, Hiraku Komura, Toshiki Nakamura

Nagoya University, Japan

TH-D-2-4 Combined Effect of Kinesthetic Illusion and Rubber Hand Illusion

Hiraku Komura*, Tomoki Shimura*, Masakazu Honda**, Masahiro Ohka*

**Nagoya University, Japan, **Industrial Research Institute of Shizuoka Prefecture, Japan*

TH-D-2-5 A Pseudo High-Speed High-Resolution Capturing Method for Fuel Injection Process by Using Phase-Shift Photograping

Kazuyuki Kojima, Feng Yuanrun, Hideaki Takahashi, Hiroyuki Sato

Shonan Institute of Technology, Japan

TH-D-2-6 Hyperbola-Based DoA Estimation Scheme and Prototype Implementation toward Robot Tracking Applications

Geunho Lee, Myungsik Kim

University of Miyazaki, Japan

Thursday, April 25 16:45-18:15 Room D(Rose)

Actuator Systems (3) Chair : Takefumi Kanda, Okayama University, Japan

TH-D-3-1 Development of Robot Chicken for Promoting Chicks' Feeding Behavior: Feasibility Study

Tomoki Uno, Minami Owada, Akifumi Yamamoto, Christian Bilgera, Tsuyoshi Shimmura, Hiroshi Ishida

Tokyo University of Agriculture and Technology, Japan

TH-D-3-2 An Intelligent Solution of Industrial Robot Health Monitoring based on IoT System Design and Deep Learning Technique

Huan Van Pham, Soonyoung Han, Jiung Huh, Hae-jin Choi

Chung-Ang University, Korea

TH-D-3-3 Estimation of WorldSID Thorax Kinematics Using Multiple 3-Axis Accelerometers

Yeseop Park, Youkeun K. Oh

Hongik University, Korea

TH-D-3-4 Fabrication of Glass Molded Nanohole Array for Enhanced Raman Spectroscopy Application

Seok-Min Kim, Jun Kim, Mohsin Ali Badshah, Jonghyun Ju, Muhammad Refatul Haq, Xun Lu

Chung-Ang University, Korea

TH-D-3-5 Development of one-axis active controlled bearingless motor working at extremely low temperature

Hirohisa Kato, Mochimitsu Komori, Ken-ichi Asami, Nobuo Sakai, Zenzo Yukitake

Kyushu Institute of Technology, Japan

Thursday, April 25 10:50-12:20 Room E(Emerald lobby)

Coatings and Surface Modification (1) Chair : Motohisa Hirano, Hosei University, Japan

TH-E-1-1 Correlation between the characteristic behavior of soft-metallic nano-crystals in the soft-metal/DLC nanocomposite coatings and the tribological properties

Minoru Goto, Masataka Maruyama

National Institute of Technology, Ube College, Japan

TH-E-1-2 Mechanism of improvement wear resistance about CNx coating overcoat on a-C:H coating in oil lubrication

Shigehiro Ito*, Noritsugu Umahara*, Takayuki Tokoroyama*, Motoyuki Murashima*, Manabu Izumida**, Naohisa Kawakami**

**Nagoya University, Japan, **Daido Metal Co., Ltd., Japan*

TH-E-1-3 The tribological properties of DLCs with various dopants and clarification of the mechanism at 200°C

Ruixi Zhang, Noritsugu Umehara, Takayuki Tokoroyama, Motoyuki Murashima

Nagoya University, Japan

TH-E-1-4 Control of Transfer Film for Low Friction of Mechanical Seals using Carbon Nitride Coatings

Kazuya Kuriyagawa, Koshi Adachi

Tohoku University, Japan

TH-E-1-5 Influence of high-density plasma on the structure of a-C:H films deposited by plasma CVD

Miyu Furuhashi, Hiroyuki Kousaka, Tatsuya Furuki

Gifu University, Japan

TH-E-1-6 Friction and wear properties of hard coatings under lubrication with low viscosity fully formulated oil

Kiichi Nakagome, Hikaru Okubo, Seiya Watanabe, Shinya Sasaki

Tokyo University of Science, Japan

Thursday, April 25 13:30-15:00 Room E(Emerald lobby)

Coatings and Surface Modification (2) Chair : Shouhei Kawada, Tokyo University of Science, Japan

TH-E-2-1 Improvement of electrical, optical, mechanical and tribological characteristics of flexible transparent conductive electrodes

Chang-Lae Kim*, Dae-Eun Kim**

**Chosun University, Japan, **Yonsei University, Korea*

TH-E-2-2 Measurement of real contact area of rubber platen rollers

Isami Nitta*, Kento Tamura*, Yosuke Tsukiyama*, Tomoko Wauke**, Hiroto Terao**

**Niigata University, Japan, **ALPS Electric Co., Ltd., Japan*

TH-E-2-3 Real contact area observation on Paper materials

Yosuke Tsukiyama, Isami Nitta

Niigata University

TH-E-2-4 Preventing Coagulated-Blood Adhesion on a Coated Electrosurgical Knife

Masahiro Kobayashi, Noritsugu Umehara, Takayuki Tokoroyama, Motoyuki Murashima

Nagoya University, Japan

TH-E-2-5 Tribological behavior of silicon carbide coating films for ceramic-on-ceramic artificial joints

Tadashi Shiota*, Miho Akiyama*, Daiki Taniya*, Yuya Omiya*, Toshiyuki Ikoma**, Masahiro Fujii*

**Okayama University, Japan, **Tokyo Institute of Technology, Japan*

Thursday, April 25 16:45-18:15 Room E(Emerald lobby)

Friction and Wear Chair : Chang-Lae Kim, Chosun University, Korea

TH-E-3-1 Generation of Low Friction by Native-Rich Protein film

Koki Kanda, Yoshiyuki Ueno, Koshi Adachi

Tohoku University, Japan

TH-E-3-2 Effect of mesh structure of tetrahedral amorphous carbon (ta-C) coating on friction and wear properties under base-oil lubrication condition with regard to fracture behavior

Mohd Muhyiddin Bin Mustafa*, Noritsugu Umehara*, Takayuki Tokoroyama*, Motoyuki Murashima*, Akinori Shibata**, Yoshiharu Utsumi**, Hideki Moriguchi**

**Nagoya University, Japan, **ITF Inc., Japan*

TH-E-3-3 Understanding morphology and tribological behavior of ta-C coating deposited by FCVA method

Woo-Young Lee*, Young-Jun Jang**, Takayuki Tokoroyama*, Motoyuki Murashima*, Noritsugu Umehara*

**Nagoya University, Japan, **Korea Institute of Materials Science, Korea*

TH-E-3-4 Effect of doped tantalum in ta-CN_x film or tantalum as counterpart material on the friction and wear properties of ta-CN_x

Koki Hojo, Motoyuki Murashima, Takayuki Tokoroyama, Noritsugu Umehara,

Nagoya University, Japan

TH-E-3-5 Influence of pulley misalignment on power transmitting efficiency and transmitting torque of metal V-belt type continuously variable transmission at steady state

Takuma Ohashi*, Kiyotaka Obunai*, Kazuya Okubo*, Kyohei Sakagami**, Toru Yagasaki**

*Doshisha University, Japan, **HONDA R&D Co. Ltd., Japan

Friday, April 26 14:15-15:45 Room A (Pearl)

Cutting/ Forming/ Grinding(1) Chair : Ryutaro Tanaka, Hiroshima University, Japan

FR-A-1-1 Accuracy of Spring-Back Factor Applied for V-Bending Die Design

Sutasn Thipprakmas

King Mongkut's University of Technology Thonburi, Thailand

FR-A-1-2 Shearing clearance and shaving allowance to minimize die-roll formation in shaving process

Arkarapon Sontamino, Sutasn Thipprakmas

King Mongkut's University of Technology Thonburi, Thailand

FR-A-1-3 Free-form draw-bead application in deep-drawing process

Wiriyakorn Phanitwong*, Sutasn Thipprakmas**

**University of Technology Rattanakosin, Thailand, **King Mongkut's University of Technology Thonburi, Thailand*

FR-A-1-4 Application of lubricant zoning in deep-drawing process

Sutasn Thipprakmasa*, Jaksawat Sriborwornmongkol*, Wiriyakorn Phanitwong**

**King Mongkut's University of Technology Thonburi, Thailand, **University of Technology Rattanakosin, Thailand*

FR-A-1-5 The CNC integrated multi-sensor tool monitoring system

Jaehyeok Kim, Gidong Yang, Dongyoon Lee

Korea Institute of Industrial Technology (KITECH), Korea

Friday, April 26 16:10-17:40 Room A (Pearl)

Cutting/ Forming/ Grinding(2) Chair : Sutasn Thipprakmas, King Mongkut's University of Technology Thonburi, Thailand

FR-A-2-1 Effect of Feed Rate on Tool Wear in Up Cut End Milling of AISI 1050 at Different Cutting Speed

Ryutaro Tanaka, Tai Yi Yeh, Kota Matsuda, Katsuhiko Sekiya, Keiji Yamada

Hiroshima University, Japan

FR-A-2-2 Surface Quality Evaluation of 0.2% C and AISI 304 Steels in Turning with Sustainable lubricating Condition

Krishan Chanaka Wickramasinghe*, G. I. P Perera*, Himan KG Punchihewa**, Hiroyuki Sasahara***

University of Ruhuna, Sri Lanka, **University of Moratuwe, Sri Lanka, *Tokyo University of Agriculture and Technology, Japan*

FR-A-2-3 A novel non-conventional method for real-time tool condition monitoring through vibration and noise analysis

Ahmad Shahir Jamaludin*, Ainur Munira Rosli*, Amiril Sahab Abdul Sani*, Mohd Nizar Mhd Razali*, Mohd Shahril Osman**, Hosokawa Akira***

Universiti Malaysia Pahang, Malaysia, **University College of Technology Sarawak, Malaysia, *Kanazawa University, Japan*

FR-A-2-4 Influence of Friction Characteristic of Cutting Fluid Evaluated by Cutting Force in Micro Feed End

Milling on Surface Roughness

Tai Yi Yeh*, Ryutaro Tanaka*, Katsuhiko Sekiya*, Keiji Yamada*, Shih Jui Chen**

**Hiroshima University, Japan, **National Central University, Taiwan*

FR-A-2-5 Application of Rough Grinding Wheel and Slant Feed Grinding to High Efficiency Machining of CFRP with Coolant Supplying from Inside of Grinding Wheel

Masahiro Kawabata*, Rei Koyasu**, Hiroyuki Sasahara*

**Tokyo University of Agriculture and Technology, Japan, **Heiwa Sangyo Co., Ltd., Japan*

Friday, April 26 14:15-15:45 Room B(Cattleya)

Machine Elements(4) Chair : Shinji Hashimura, Shibaura Institute of Technology, Japan

FR-B-1-1 A study on influence of surface roughness on bearing surface in torque control method using lubricants

Shota Inoue*, Shinji Hashimura*, Takefumi Otsu**, Kyoichi Komatsu***

Shibaura Institute of Technology, Japan, **Oita University, Japan, *Tohnichi Mfg. Co., Ltd., Japan*

FR-B-1-2 Effect of Bending Moment on the Fatigue Strength of a Bolt in Bolt/Nut Assembly

Masaya Hagiwara, Ryota Suzuki

Nagoya Institute of Technology, Japan

FR-B-1-3 Effects of Surface Conditions on Embedment in Bolted Joints

Masataka Nomura, Toshimichi Fukuoka, Masanori Takezaki

Kobe University, Japan

FR-B-1-4 Influence of Tightening Speed on Rapture of Screw Threads

Yuya Omiya, Hayaki Kawaguchi, Tadashi Shiota, Masahiro Fujii

Okayama University, Japan

Friday, April 26 16:10-17:40 Room B(Cattleya)

Sustainable Tribology Chair : Koki Kanda, Tohoku University, Japan

FR-B-2-1 Performance Evaluation of Phosphorus-containing Compounds Combined with Sulfurized Olefin and Overbased Calcium Sulfonate in Cold Forming

Tomohiro Takaki*, Kazuhiro Yagishita*, Toshiaki Wakabayashi**

**JXTG Nippon Oil & Energy Corp., Japan, **Kagawa University, Japan*

FR-B-2-2 Self-formation of low frictional interface in engine oil with silicon-containing aluminum alloy

Kento Ihara, Yasuhisa Yamamoto, Koshi Adachi

Tohoku University, Japan

FR-B-2-3 Development of control method for friction stabilization

Takazumi Yamada, Noritugu Umehara, Takayuki Tokoroyama, Motoyuki Murashima

Nagoya university, Japan

FR-B-2-4 Relationship between Casting Condition and Gas Porosity in Magnesium Alloy Die Casting

Yuki Kashiwabara*, Lidiana Binti Roslan**, Mohd Danial Ibrahim**, Masayuki Ochiai*, Hiromu Hashimoto*, Yuta Sunami*

**Tokai University, Japan, **Universiti Malaysia Sarawak, Malaysia*

FR-B-2-5 Application of grease lubrication to sliding surfaces of Cu-dispersed PTFE

Taisei Osawa*, Satoru Maegawa*, Takashi Nakamura**, Fumihiro Itoigawa*

**Nagoya Institute of Technology, Japan, **Nagoya university, Japan*

FR-B-2-6 Hydrodynamic lubrication performance of parallel thrust bearings with dimples

Terunao Kishida*, Norifumi Miyanaga*, Jun Tomioka**

*Kanto Gakuin University, Japan, **Waseda University, Japan

Friday, April 26 14:15-15:45 Room C(Orchid)

Manufacturing Systems(1) Chair : Hiroyuki Kousaka, Gifu University, Japan

FR-C-1-2 Experimental study on the robot arm based hole drilling process for carbon fiber reinforced plastics

Dongchan Kim, Jae woo Seo, O-seop Kwon, Ji su Kim, Hyung wook Park

Ulsan National Institute of Science and Technology, Korea

FR-C-1-3 Positioning solution in reconfigurable fixtures for machining free form CFRP sheets

Minh Duc Do, Mingeon Kim, Duy Hung Nguyen, Hae-Jin Choi

Chung-Ang University, Korea

FR-C-1-4 A Study on Computer Aided Process Planning of Parts Machining under Fixing Limitations

Wataru Komatsu, Yuki Inoue, Keiichi Nakamoto

Tokyo University of Agriculture and Technology, Japan

FR-C-1-5 Proposal of Complex Parts Machining Securing Dynamic Stiffness of Workpiece During a Rough Machining Operation

Maho Kumanotani, Hitoshi Kushino, Keiichi Nakamoto

Tokyo University of Agriculture and Technology, Japan

FR-C-1-6 Development of highly sensitive antibody chip for identification of semen

Seong Min Lee, Xun Lu, Mohsin Ali Badshah, Naseam Abbas, Seok Min Kim

Chung-Ang University, Korea

Friday, April 26 16:10-17:40 Room C(Orchid)

Manufacturing Systems(2) Chair : Keiichi Nakamoto, Tokyo University of Agriculture and Technology, Japan

FR-C-2-1 Problems of class imbalance and multiclass classification in artificial intelligences for the product quality control

Hae-Jin Choi, Soonyoung Han

Chung-Ang University, Korea

FR-C-2-2 Segmentation of Knee MR Images using Watershed-based Technique

Jaewoo Shin, Youkeun K Oh

Hongik University, Korea

FR-C-2-3 Posture optimization and compliance control for the family of the kinematic redundant parallel robots with rotational mechanisms embedded in the moving part

Rei Tsuchihara, Takashi Harada

Kindai University, Japan

FR-C-2-4 Inductive design exploration method with active sampling for handling high computational cost

Sungwoo Jang, Hae-Jin Choi

Chung-Ang University, Korea

FR-C-2-5 The Impact of the New iPhone Announcement on the Stock Prices of Apple's Supply Chain in Taiwan

Bi-Huei Tsai, Ching-Feng Chen

National Chiao Tung University, Taiwan

Friday, April 26 14:15-15:45 Room D(Rose)

Polishing **Chair : Noritsugu Umehara, Nagoya University, Japan**

FR-D-1-1 **Effect of spray nozzle position on pad temperature distribution and wafer non-uniformity**

Kihun Lee, Haedo Jeong, Dasol Lee, Seonho Jeong, Donghwan Lee

Pusan National University, Korea

FR-D-1-2 **FEM stress analysis between copper and polymer interface in package substrate CMP**

Seonho Jeong, Kihun Lee, Donghwan Lee, Somjin Shin, Haedo Jeong

Pusan National University, Korea

FR-D-1-3 **Simulation of CMP polishing pad profile according to diamond arrangement of conditioning disk**

Donghwan Lee*, Haedo Jeong*, Hanchul Cho**, Dasol Lee*, Seonho Jeong*

**Pusan National University, Korea, **Korea Institute of Industrial Technology, Korea*

FR-D-1-4 **Elucidation of interaction in lapping process using low hardness abrasive grains and hard abrasive grains**

Hiroaki Takeno*, Takayuki Tokoroyama*, Noritsugu Umehara*, Motoyuki Murashima*, Shogo Chiba**

**Nagoya University, Japan, **Saito Optical Science Ltd., Japan*

FR-D-1-5 **Colloidal slurry activation by AC electric field for reduction of slurry consumption**

Dasol Lee*, Kihun Lee*, Seonho Jeong*, Minjong Yuh**, Haedo Jeong*

**Pusan National University, Korea, **G&P Technology, Korea*

Friday, April 26 16:10-17:40 Room D(Rose)

Rapid Prototyping **Chair : Young Hun Jeong, Kyungpook National University, Korea**

FR-D-2-1 **Permeability of Release Agent inside the Porous Structure Built by Metal-based Additive Manufacturing**

Tatsuaki Furumoto*, Ryo Ikeya*, Makoto Nikawa**, Nobuhisa Hayashi***, Yuki Hori***

Kanazawa University, Japan, **Gifu University, Japan, *Shippo Moulds Co., Ltd., Japan*

FR-D-2-2 **Relationship between spatter particle behavior and volume specific energy density in SLM process**

Kazushi Oishi*, Tatsuaki Furumoto*, Kyota Egashira*, Satoshi Abe**, Yohei Hashimoto*, Tomohiro Koyano*, Akira Hosokawa*

**Kanazawa University, Japan, **Panasonic Corporation Eco Solutions Company, Japan*

FR-D-2-3 **A Study on Thermo-Mechanical Characteristics for a Multi-Layer Deposition Using a Wire Feeding Type DED Process**

Bih-Lii Chua*, Dong-Gyu Ahn*, Jae-Gu Kim**

**Chosun University, Korea, **Korea Institute of Machinery and Materials, Korea*

FR-D-2-4 **Experimental Characterization on Functionally Graded Material of Stainless Steel 316L and Inconel 718 Fabricated by Directed Energy Deposition**

Jung Sub Kim, Sang Won Lee

Sungkyunkwan University, Korea

Friday, April 26 14:15-15:45 Room E(Emerald lobby)

Friction and Wear /Micro Tribology **Chair : Yousuke Tsukiyama, Niigata University, Japan**

FR-E-1-1 **Friction and Wear of a Medical Mouthguard Material in Reciprocating and Unidirectional Rotation Sliding**

Tomoharu Akagaki, Takuya Nitadori, Taiki Nishimura

National Institute of Technology, Hachinohe College, Japan

FR-E-1-2 **Development of new active friction control system with morphing surface (Smart Surface) in dry**

Condition

Yusuke Imaizumi, Motoyuki Murashima, Noritsugu Umehara, Takayuki Tokoroyama
Nagoya University, Japan

FR-E-1-3 Increase in EHL Oil Film Thickness by Microdimples on Contact Surface under Squeezing Motion

Daiki Matsuoka, Tomoko Hirayama, Takashi Matsuoka, Hidetoshi Sakamoto
Doshisha University, Japan

FR-E-1-4 Improvement of Run-Out Characteristics by Partial Texturing on Journal Bearing under Periodic Fluctuating Load

Suzuka Okumura*, Tomoko Hirayama*, Shinichiro Ido**, Yoshimi Ikeda**, Tatsuya Sasaki**
**Doshisha University, Japan, **Mitsubishi Electric Corporation, Japan*

FR-E-1-5 New Oil Supply Technology for Hybrid Ceramic Bearing for Space Applications -Evaluation of Oil Flow Characteristics from the Oil Supply System-

Toru Kamiya*, Kazuyoshi Yamakawa*, Kazuhisa Kitamura*, Akira Koyama*, Kazuaki Maniwa**, Shingo Obara**
**JTEKT Corp., Japan, **Aerospace Exploration Agency, Japan*

FR-E-1-6 Development of equipment to make failure in a test bearing to be used for bearing diagnosis experiments

Taiga Uchihashi, Toshiki Kobayashi, Nobuhiko Henmi
Shinshu University, Japan

Friday, April 26 16:10-17:40 Room E(Emerald lobby)

Friction and Wear /Micro Tribology Chair : Minoru Goto, National Institute of Technology, Ube College, Japan

FR-E-2-1 Atomistic Friction Phase Diagram and Non-linear Dynamical Effects in Frictional Energy Dissipation

Motohisa Hirano, Shuta Inoue, Kenta Kimura
Hosei University, Japan

FR-E-2-2 Tribological Performances of Halogen-free Ionic Liquids against a-C: H and ta-C Film under Vacuum Condition

Shouhei Kawada, Shinya Sasaki, Masaaki Miyatake
Tokyo University of Science, Japan

FR-E-2-3 In-situ observation of growth process of anticorrosion films formed on brass surface using Otto-SPR microscope

Takamasa Kawasaki*, Satoru Maegawa*, Kentaro Tamura**, Kazuhiro Yagisita**, Takashi Nakamura***, Fumihiro Itoigawa*
Nagoya Institute of Technology, Japan, **JXTG Nippon Oil & Energy Corp., Japan, *Nagoya University, Japan*

FR-E-2-4 Measurement of temperature dependences of micro scale lubrication properties using AFM

Motoi Miyazawa, Yasuhisa Ando, Yasutaka Takeuchi
Tokyo University of Agriculture and Technology, Japan

FR-E-2-5 Improvement in Sliding Property of Carbon Steel by Cavitation Peening

Masanori Seki*, Hitoshi Soyama**, Masahiro Fujii***
Okayama University of Science, Japan, **Tohoku University, Japan, *Okayama University, Japan*

FR-E-2-6 Study of Mechanical properties of Electro-Spun Polyacrylonitrile Nano-fibrous Separator According to Thermal Press Temperature

Thursday Poster Session

- TH-PO-01 Driving Test of Non-involute Tooth Profile Gear Pump to Reduce Driving Noise**
Natsuhiko Seyama, Hideto Mashidori, Ema Tamura, Hiroshi Umezawa
Tokyo Metropolitan College of Industrial Technology, Japan
- TH-PO-02 Tapping Screw Threads with Ultrasonic Vibration**
Manabu Okada*, Yousuke Hanamura**, Tan Tawfiq***, Balqis Hanis binti Ali****
National Institute of Technology, Japan, **Tokyo University of Agriculture and Technology, Japan, *Toyohashi University of Technology, Japan, ****Kuroda Precision Industries Ltd., Japan*
- TH-PO-03 Effect of Grease Composition on Bulk Temperature of Plastic Spur Gear**
Jinta Goto*, Hiroki Makino**, Tomohiro Kuratani**, Yousuke Kimura**, Takayoshi Itagaki*, Mikio Takahashi*, Hideo Takahashi*
**National Institute of Technology, Kisarazu College, Japan, **Nippeco Ltd., Japan*
- TH-PO-04 Loadability of Hexagon Socket Countersunk Head Screws (Effect of Head Shape on the Loadability)**
Yuto Takeuchi, Masaya Hagiwara
Nagoya Institute of Technology, Japan
- TH-PO-05 A Study on the Equivalent Bulge Joint Model of Nuclear Fuel Cell Assemblies**
Jae Kyu Park, Taek Jin Jang, Hyeon Jun Jung, Se Hoon Lim, Jong-Bong Kim
Seoul National University of Science and Technology, Korea
- TH-PO-06 Observation of dependence of ta-C surface graphitization on Deep ultraviolet laser intensity**
Tomomi Koza*, Makoto Yamaguchi*, Masahiro Kawaguchi**, Masamichi Yoshimura***
Akita University, Japan, **Tokyo Metropolitan Industrial Technology Research Institute, Japan, *Toyota Technological Institute, Japan*
- TH-PO-07 Influence of Ion Dosages of Ru Implanted WC-based Cold Sprayed Coatings on Sliding Wear Properties**
Peerawatt Nunthavarawong*, Natasha Sacks**,***, Ionel Botef**,***
King Mongkut's University of Technology North Bangkok, Thailand, **University of the Witwatersrand, South Africa, *DST-NRF Centre of Excellence in Strong Materials, South Africa*
- TH-PO-08 Ultrasonic Nano Surface Modification for Improving Surface Quality of SUS316L built by Direct Energy Deposition**
Do-Sik Shim, Min Seop Kim, Young Kwan Cho, Sang Hu Park
Korea Maritime and Ocean University, Korea, Pusan National University, Korea
- TH-PO-09 Green and Facile Synthesis of Dual Functional Cellulose Hybrid Membranes: A Study on Conducting and Antibacterial Properties**
Zahid Hanif, Dae Yong Shin, Sung Jea Park
Korea University of Technology and Education, Korea

- TH-PO-10 Influence of paper lint adhesion on the wear form of rubber roller for paper feed**
Tetsuya Tsumori, Yosuke Tsukiyama, Isami Nitta
Niigata University, Japan
- TH-PO-11 Tribological properties between fishing rod guides and fishing lines made with various materials under water environment**
Naoya Nakabayashi, Naohiro Matsumoto, Hiroshi Kinoshita
University of Hyogo, Japan
- TH-PO-12 Tribological property of cellulose nanofiber water dispersion using various lubricating materials**
Yoichi Inada, Naohiro Matsumoto, Hiroshi Kinoshita
University of Hyogo, Japan
- TH-PO-13 Fatigue Life of Small Ball Bearing in Case of Non-Lubrication (at axial load 10N 4000min⁻¹)**
Suguru Takeshita, Tomoya Hotta
Kanto Gakuin University, Japan
- TH-PO-14 Influence of Axial External Vibration to Damage of Small Ball Bearings (In Case of Giving Axial Vibration up to 49.5Hz and 2.5m/s²)**
Roberto Hamada*, Tomoya Hotta*, Shouji Noguchi**
**Kanto Gakuin University, Japan, **Tokyo University of Science, Japan*
- TH-PO-15 Performance Evaluation for Bubble Eliminator with CFD ? Effect of Computational Model and Mesh ?**
Ryo Takamizawa*, Ryosuke Funachi*, Sayako Sakama**, Yutaka Tanaka*
**Hosei University, Japan, **Aoyama Gakuin University, Japan*
- TH-PO-16 Numerical and Experimental Study on Characteristics of a Milling Spindle Supported by Aerostatic Bearings**
Keita Shimada, Shouhei Kawada, Masaaki Miyatake, Shigeka Yoshimoto
Tokyo University of Science, Japan
- TH-PO-17 Contactless gripper using ultrasonic levitation for handling light objects**
Yusaku Katayama, Shouhei Kawada, Masaaki Miyatake, Shigeka Yoshimoto
Tokyo University of Science, Japan
- TH-PO-18 Characteristics of Aerodynamic Foil Thrust Bearings Manufactured Using Direct Metal Printing Technology**
Zheng Chuanyu, Alzarooni Rashid, Shouhei Kawada, Masaaki Miyatake, Shigeka Yoshimoto
Tokyo University of Science, Japan
- TH-PO-19 A Method of Reducing Windage Power Loss of a High-Speed Motor Using a Viscous Vacuum Pump**
Junpei Horiike, Daiki Sato, Shouhei Kawada, Masaaki Miyatake, Shigeka Yoshimoto
Tokyo University of Science, Japan
- TH-PO-20 Proposal of Innovative Oil-hydraulic Component to Reduce Pressure Pulsation**
Misaki Hashimoto*, Yasuo Sakurai*, Norikazu Hyodo**, Kenichi Aiba**
**Ashikaga University, Japan, **Tokyo Keiki Corp., Japan*
- TH-PO-21 FM-AFM atomic-scale observation of the adsorption film structure in oiliness agent solution on steel surface**
Yuko Sato, Haruka Ouchi, Kaisei Sato, Seiya Watanabe, Shinya Sasaki
Tokyo University of Science, Japan

- TH-PO-22 Flow Visualization on Fluidic Diodes and Tube Banks Using 2D-Time-SLIP MRI and 2D-PIV-Pilot Study of a Noncontact Observation Technique on Fluid Machinery-**
 Kazunori Hosotani*, Kotaro Oka*, Kazuhiro Takeuchi**, Atsushi Ono***, Yusuke Hashiguchi****, Toru Ishihara*
National Institute of Technology, Tsuyama College, Japan, **National Hospital Organization Okayama Medical Center, Japan, *Kawasaki University of Medical Welfare, Japan, ****Kousei hospital, Japan*
- TH-PO-23 Influence of Grease Rheology on Frictional Torque of Radial Ball Bearings**
 Norifumi Miyanaga*, Mitsumi Nihei*, Jun Tomioka**
**Kanto Gakuin University, Japan, **Waseda University, Japan*
- TH-PO-24 Film formation properties of PIB lubricant for use in screw tightening in various operating conditions**
 Takefumi Otsu*, Kyoichi Komatsu**, Shinji Hashimura***
Oita University, Japan, **Tohnichi Mfg. Co., Ltd., Japan, *Shibaura Institute of Technology, Japan*
- TH-PO-25 Design of a New Velocity-Based Mechanical Safety Device for Wheeled Mobile Robots**
 Yoshiaki Sato*, Shuhei Shinoda*, Yuma Sato*, Yoshihiro Kai*, Kenichi Abe**, Hiroshi Wada***
Tokai University, Japan, **Kanagawa Institute of Industrial Science and Technology, Japan, *DOUBLE Research and Development Co., Ltd., Japan*
- TH-PO-26 Design of a Wheeled Mobile Robot Equipped with New Velocity-Based Mechanical Safety Devices**
 Shuhei Shinoda*, Yoshiaki Sato*, Yuma Sato*, Yoshihiro Kai*, Abe Kenichi**, Hiroshi Wada***
Tokai University, Japan, **Kanagawa Institute of Industrial Science and Technology, Japan, *DOUBLE Research and Development Co., Ltd., Japan*
- TH-PO-27 Multi-Objective Optimization Technique applying to Shape Optimization for Large-Scale Wind Turbine Generator**
 Seung-ho Han, Hyungjun Park
Dong-A University, Korea
- TH-PO-28 Development of a compact velocity-based mechanical safety device for rehabilitation assist suits: Detailed design**
 Yoshihiro Kai, Tsubasa Kaneda, Keisuke Ikeda
Tokai University, Japan
- TH-PO-29 Design of a 5-axis manipulator for the finishing application**
 Sangki Park, Daegwon Koh, Jaeyoon Shim, Sun-Kyu Lee
Gwangju Institute of Science and Technology, Korea
- TH-PO-30 Force Analysis of Pin Ball Lock Using DAFUL**
 Hee Yong Kang, Hyeon Ho Shin, Sung Mo Yang, Que Man Kim
Chonbuk National University, Korea
- TH-PO-31 Wrench-closure and Non-slipping Condition of a Frictional Cable-Driven Planar Parallel Robot with Kinematic Redundancy**
 Koki Hirotsato, Takashi Harada
Kindai University, Japan
- TH-PO-32 Rotational plating process design with computational flow analysis**
 Joo-Pyo Hong*, Midum Jung**
**KOREATECH, Korea, **Solution Lab, Korea*

- TH-PO-33 Comparison between functional tolerancing and manufacturing-oriented tolerancing methods in GD&T and development of a trade-off tolerancing method**
Daehyun Son, Minyoung Park, Hyunjune Yim
Hongik University, Korea
- TH-PO-34 Definition of training data structure for deep learning model to recognize engineering drawings in image format**
Eun-seop Yu, Duhwan Mun
Kyungpook National University, Korea
- TH-PO-35 Two-dimensional Delaunay triangulation of a bone from a CT image considering its heterogeneity**
Byung Chul Kim, Junho Lee
Korea University of Technology and Education, Korea
- TH-PO-36 Motion Accuracy of Spherical Coordinate Type Driving Mechanism for Automated 3D Scanning**
Changhyuk Lim, Jiwan Kang, Heeyoung Maeng
Seoul National University of Science and Technology, Korea
- TH-PO-37 Development of Hydraulic Manipulator of Armored Robot for Disaster Response**
Jong Geol Kim, Sang Hyun Park, Dong Bin Shin, Maolin Jin
KIRO, Korea
- TH-PO-38 A Study on Induction Motor Shaft Vibration and Noise Characteristic Analysis**
MyeongJin Ko, Sung-Ho Lee, Hyoun-Seon Shim, Soon-Sub Park
Korea Institute of Industrial Technology, Korea
- TH-PO-39 Safety evaluation of autonomous vehicle in the condition of the cut-in situation**
Seohang Lee, Sanghyeop Park, Jayil Jeong
Kookmin University, Korea
- TH-PO-40 Parameter Estimation of Anthropometric Dummy's Rib Using System Identification**
JaeJong Lim, Suji Kwon, Youkeun K Oh
Hongik University, Korea
- TH-PO-41 Fabrication Design of Magnetic Field Applying Mechanism using Permanent Magnet for MRF Clutch**
Yorihiko Yano^{*}, Shunsuke Kawamura^{*}, Kota Tsuda^{*}, Katsuhiro Hirata^{**}
^{}National Institute of Technology, Nara College, Japan, ^{**}Osaka University, Japan*
- TH-PO-42 Design of Personal Mobility Vehicle Using Tripod Parallel Mechanism**
Tomomasa Nakamura, Masahiro Ikeda, Yutaka Tanaka
Hosei University, Japan
- TH-PO-43 Design and Fabrication of ER Braking Device for Small Mobile Robot**
Takuma Tachibana, Takanori Togawa, Yutaka Tanaka
Hosei University, Japan
- TH-PO-44 Development of a jellyfish soft robot using shape memory alloy actuators**
Hironari Taniguchi^{*}, Tatsuki Ohno^{*}, Kazumori Hosotani^{**}, Yusuke Inoue^{**}
^{}Osaka Institute of Technology, Japan, ^{**}National Institute of Technology, Tsuyama College, Japan*
- TH-PO-45 Power-saving non-electromagnetic control of magnetorheological fluid actuator device**
Yasukazu Sato, Yuki Nakamura
Yokohama National University, Japan
- TH-PO-46 High-efficient electro-hydraulic power transmission by servomotor-driven variable displacement**

hydraulic pump

Seiya Itagaki, Ha Tham Phan, Yasukazu Sato

Yokohama National University, Japan

TH-PO-47 Characteristics of In-pipe Mobile Robot with snake-like drive mechanism using pneumatic actuator

Toyomi Miyagawa, Tomohiro Koso

Nippon Institute of Technology, Japan

TH-PO-48 Study on compact and lightweight mechanism for pet robot used in reminiscence therapy

Yuchi Nakazato*, Kenta Kyojima**, Nobuhiko Araki**, Kensuke Takita*, Masaru Higuchi*

**Nippon Institute of Technology, **Grad school of Mechanical Systems Engineering, Nippon Institute of Technology, Japan*

TH-PO-49 The cleaning module for underwater remotely operated vehicle

Jinho Lee*, Seok-Woo Lee*, Cheol Ho Kim*, Tae-gon Kim*, Hyo-young Kim*, Kang Woo Shin*, An-Mok Jeong*, Jong Uk An*, Hyun Ho Lee**

**Korea Institution of Industrial Technology, Korea, **Ajou University, Korea*

TH-PO-50 A design of multiple-motion mode switching robot

Xiaotian Sun, Soo-Hong Lee

Yonsei University, Korea

TH-PO-51 Study on impact factor calculation method for AT crane using transient response analysis

Mansoo Go, Soonki Kwon

Hoseo University, Korea

TH-PO-52 Study on weight reduction of semiconductor inspection equipment using sensitivity analysis

Soonki Kwon, Mansoo Koh

Hoseo University, Korea

TH-PO-53 Development of toe assisting device for assisting walking

Ujo Hasegawa, Naoki Fukaya

Tokyo Metropolitan College of Industrial Technology, Japan

TH-PO-54 A Study on Improving the Power of Paper-Based Microfluidic Electrochemical Fuel Cell

Cheonho Lee, Guitao Yang, Noh Hyun Park, Do-gyun Jung, Yoomin Ahn

Hanyang University, Korea

TH-PO-55 Fabrication of Si Nanowire Photodetector using Simple Wet Etching Process

Dong-Ki Lee, Joo Yong Kwon, Young Hak Cho

Seoul National University of Science and Technology, Korea

TH-PO-56 Trespasser Surveillance System for a Fish Farm

ChangHo Yu

Pusan National University, Korea

TH-PO-57 Safety assessment methods of ACC and AEBS functions in cut-out situations reflected accidents

Sanghyeop Park, Jayil Jeong, Seohang Lee

Kookmin University, Korea

TH-PO-58 Monitoring the Optical Power of LED by Combining Radiation type Thermocouple

Youyoung Kim, Daegwon Koh, Sun-Kyu Lee

Gwangju Institute of Science and Technology, Korea

TH-A-2-2 Light-weight heat exchanger manifold design using topology optimization and its experimental

evaluation

Jaehyun Yu*, HanJong Kim*, SeulBi Lee*, Yong Son**, SangHu Park*

*Pusan National University, Korea, *Korea Institute of Industrial Technology (KITECH), Korea

Friday, April 26 10:30-12:00 Room E (Emerald lobby)

Friday Poster session

- FR-PO-01 Friction characteristics of micro-textured surfaces with diamond-like carbon coating**
Shion Saito*, Yasuhisa Ando*, Tsuguyori Ohana**
**Tokyo University of Agriculture and Technology, Japan,*
***National Institute of Advanced Industrial Science and Technology, Japan*
- FR-PO-02 Study on contact condition of nanomaterial through molecular dynamics simulation**
Hyun-Joon Kim*, Koo-Hyun Chung**
**Kyungpook National University, Korea, **University of Ulsan, Korea*
- FR-PO-03 Molecular dynamics simulations of effects of inter-atomic distance on friction force**
Takumi Shimakura, Shu Kimura, Yasuhisa Ando
Tokyo University of Agriculture and Technology, Japan
- FR-PO-04 Investigation of tribological characteristics of multi-layered thin film**
Youn-Hoo Hwang, Seong-Yun Jung, Hyun-Joon Kim
Kyungpook National University, Korea
- FR-PO-05 Hardness distribution in a heavily cold-rolled SUS316LN austenitic stainless steel**
Chihiro Watanabe*, Yoshiteru Aoyagi**, Yoshikazu Todaka***, Masakazu Kobayashi***, Hiromi Miura***
Kanazawa University, Japan, **Tohoku University, Japan, *Toyohashi University of Technology, Japan*
- FR-PO-06 Study on the Influence of Carbon Source on Pore Structure of Ordered Porous Carbon Ultra-Thin Film**
Makio Tamada, Yuta Sunami, Hiromu Hashimoto
Tokai University, Japan
- FR-PO-07 Relationship between friction behavior and mechanical properties of tribo-films under boundary lubrication by using nano-indentation technique**
Yu Nito, Seiya Watanabe, Kenta Takahashi*, Shota Ito, Shinya Sasaki
Tokyo University of Science, Japan
- FR-PO-08 Dynamic Characteristics of Externally Pressurized Gas Journal Bearings Characteristics With Asymmetric Gas Supply**
Tomohiko Ise*, Kohei Nagao**, Masami Matsubara**, Shozo Kawamura**, Tomoya Kinugawa***, Shinya Kikutani***, Masaya Kurokawa
Kindai University, Japan, **Toyohashi University of Technology, Japan, *Starlite Co., Ltd., Japan*
- FR-PO-09 A study on modified real contact area and material removal rate model for CMP**
Hyunseop Lee
Tongmyong University, Japan

- FR-PO-10 Optimization of CFRP Deburring Using Dry EDM Process**
 Ki Moon Park, Tae Jo Ko, Zhen Yu
Yeungnam University, Korea
- FR-PO-11 An Experimental Research on Effect of Cutting Speed and Coating Material upon Tool Life in Dry Hobbing**
 Akio Kubo*, Hua Qiu*, Hironori Matsuoka**
**Kyushu Sangyo University, Japan, **Oita University, Japan*
- FR-PO-12 A Study on Experimental Verification and Cutting Force of Machine Tool Using NAK - 80 Plastic Mold Steel**
 Seung-Yub Beak, Sung-Taek Jung, Seong-Hyun Kim, Hyun-Jeong Kim
Induk University, Korea
- FR-PO-13 Finite Element Analysis on Dynamic Viscoelasticity of CMP Polishing Pad**
 Haedo Jeong*, Byeongjun Pak**, Dasol Lee*, Seonho Jeong*, Donghwan Lee*
**Pusan National University, Korea, **Korea Institute of Industrial Technology, Korea*
- FR-PO-15 EXPERIMENTAL OBSERVATION OF THE CRYOGENIC ASSISTED HARD TURNING PROCESS**
 Hyung Wook Park*, Dong Min Kim**, Do Young Kim*, In Su Jo*
**Ulsan National Institute of Science and Technology, Korea, **Korea Institute of Industrial Technology, Korea*
- FR-PO-17 Numerical study on machining characteristics of milling process with a low temperature nitrogen gas and minimum quantity lubricant**
 Woo-Yul Kim, Hong-Cheol Shin, Jin Woo Kim, Sang Won Lee, Sung-Min Kim
Sung Kyun Kwan University, Korea
- FR-PO-18 Magnetic Characteristics of rectangular ElectroMagnetic Chuck for Grinding Machine**
 Donghyuk LEE, Heeyoung MAENG
Seoul Tech, Korea
- FR-PO-19 Micromachining of polycrystalline CVD diamond coated cutting tool with femtosecond laser**
 Xiaoxu Liu*, Kohei Natsume*, Satoru Maegawa*, Fumihiro Itoigawa*, Shingo Ono*, Michiharu Ota**
**Nagoya Institute of Technology, Japan, **IMRA America, Inc, Japan*
- FR-PO-20 Development of Localized Heating Module for Injection Mold**
 Seung A Oh, Keun Park
Seoul National University of Science & Technology, Korea
- FR-PO-21 Fabrication of Sinusoidal Wavy Surfaces for Cell Alignment**
 Sung Jea Park, Sung Jea Park
Korea University of Technology and Education, Korea
- FR-PO-22 Effect of processing parameters in thermoforming process of micro-structured polystyrene films**
 Trieu Khoa Nguyen**, Bong-Kee Lee*
**Chonnam National University, Korea, **Industrial University of Ho Chi Minh City, Vietnam*
- FR-PO-23 Evaluation of Mechanical Properties for Tool Steel that Fabricated by Using 3D Metal Printing**
 Sung Jong Choi*, Ho Chan Kim*, Jong Dock Seo**
**Andong National University, Korea, **SHIN YOUNG Co., Ltd., Korea*
- FR-PO-24 Fabrication of antireflective glass nanostructures using vitreous carbon mold by glass imprinting**
 Muhammad Refatul Haq, Mohsin Ali Badshah, Jun Kim, Young Kyu Kim, Seok-min Kim
Chung-Ang University, Korea

- FR-PO-26 Development of the pbf type 3d printer for mouldbase and biomedical applications**
 Min Ha Kim*, Hyun Ah Lee**, Dong Soo Kim**
**TOPnC Co., LTD., Korea, **Hanbat National University, Korea*
- FR-PO-27 Accurate stacking of cell-laden constructs by heating module included in three-dimensional (3D) bioprinting system**
 Geunseon Ahn*, Songwan Jin**, Won-Soo Yun**, Jin-Hyung Shim**
**T&R Biofab Co., Ltd., Korea, **Korea Polytechnic University, Korea*
- FR-PO-28 Low Temperature Annealing Process For Solution Based Metal Oxide Thin Film Transistor By Using Deep UV**
 Daehwan Chae, Jaehak Shin, Jaemin Kim, Sungrim Ko
Konkuk University, Korea
- FR-PO-29 3D customized tissue engineering tube mimicking mechanical property of vascular tissue**
 Ji Eun Lee, Seong Je Park, Nak Kyu Lee, Yong Son, Suk-Hee Park
Korea Institute of Industrial Technology, Korea
- FR-PO-30 Measurement of gaseous materials generated during FDM process of thermoplastic materials**
 Seongje Park, Jieun Lee, Jaewon Choi, Jeanho Park, Nak-Kyu Lee, Yong Son, Suk-Hee Park
Korea Insititute of Industrial Technology, Korea
- FR-PO-31 Developing a Web-based system to retrieve processing conditions of 3D metal printing for the maintenance of parts**
 Inhyeok Lee*, Taeyun Kim*, Deajung Kim**, Duhwan Mun*
**Kyungpook National University, Korea, **InssTek Inc., Korea*
- FR-PO-32 Delta volume calculation for the partial damage region of parts**
 Youngki Kim*, Kiyoun Kwon**, Duhwan Mun***, Soonhung Han*
**Korea Advanced Institute of Science and Technology, Korea,
 Kumoh National Institute of Technology, Korea, *Kyungpook National University, Korea*
- FR-PO-33 Fabrication of a small sized drone with integrated structure using a Fused Deposition Modeling process**
 Hyun-Sik Kim*, Dong-Gyu Ahn*, Seung-Ki Moon*, Dae-Yong Seong***, Ji-Hun Hwnag***
Chosun University, Korea, **Nanyang Technological University, Korea, *LG Electronics, Korea*
- FR-PO-34 A Study on Heat Transfer Characteristics of Selective Laser Melting Process Using Three-dimensional Finite Element Analysis**
 Lee Kwang Kyu*, Hyun-Sik Kim*, Ho-Jin Lee**, Dong-Gyu Ahn*, Yong Son**
**Chosun university, Korea, **Korea Institute of Industrial Technology, Korea*
- FR-PO-35 Temperature Distribution of Food Cartridge for Food 3D Printing Heating System**
 Ju Ho Park, In Hwan Lee
Chungbuk National University, Korea
- FR-PO-36 4D Printing Using Anisotropy of FDM Printed Parts**
 Bona Goo, Chae Hee Hong, Keun Park
Seoul National University of Science and Technology, Korea
- FR-PO-37 Development of MID rapid processing technology using FDM 3D printing**
 Namhoon Jang, Jeonghee You, Keun Park
Seoul National University of Science and Technology, Korea

- FR-PO-38 A Study on the Effects of Deposition Condition on the Deposited part with Hastelloy-X using SLM process**
Ho-Jin Lee, Woosung Kim, Ji Hyun Sung, Dong Yong Park, Heyjin Song, Myung-Pyo Hong
Korea Institute of Industrial Technology, Korea
- FR-PO-39 Direct printing of a piezoresistive pressure-sensitive material on a flexible substrate**
Chaima Fekiri, Song Ho Kim, In Hwan Lee
Chungbuk National University, Korea
- FR-PO-40 Printable MWCNT and PDMS based Pressure Sensor**
Hochan Kim, Sungjong Choi, Jindong Kim
Andong National University, Korea
- FR-PO-41 Measurement of High-Speed Impact Properties of AISI 4140 Steel by Heat Treatment Processes**
Yongho Jeon, Moon G. Lee, Chang-Ho Jung, You-Sung Kang
Ajou University, Korea
- FR-PO-42 A Study on Estimation of Welding Deformation Using Lightweight Model**
Kiyoun Kwon
Kumoh National Institute of Technology, Korea
- FR-PO-43 Numerical Investigation on He and Ar Gas Convective Cooling for Optical Fiber Glass Drawing at Short Draw Towers**
Kyoungjin Kim, Gia Ginelle Carandang
Kumoh National Institute of Technology, Korea
- FR-PO-44 Roll to Roll laminating technology using Direct Gravure coater and Application to Pouch for Secondary Battery**
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- FR-PO-45 Enhancement of indium oxide thin film transistor by the environmental conditions and IPL irradiation energy**
Jaehak Shin, Ko Sunglim, Kim Jaemin, Chae Daewhan
Konkuk University, Korea
- FR-PO-46 Improvement of tool life in Inconel 718 turning process using cryogenic cooling**
Kangwoo Shin, Jung-Soo Nam, Hyo-Young Kim, Seok-Woo Lee, Tae-Gon Kim
Korea Institute of Industrial Technology, Korea
- FR-PO-47 Optimization of the number and layout of clamps, and the welding sequence in automotive body welding process**
Minyoung Park, Daehyun Son, Hyunjune Yim
Hongik University, Korea
- FR-PO-48 Machinability analysis in Drilling Holes using Industrial Robot**
Hyoyoung Kim^{*}, Jin Ho Lee^{***}, Moon G. Lee^{**}, Tae Gon Kim^{*}, Gang U Shin^{*}, Seok Woo Lee^{*}
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- FR-PO-50 Process Improvement of Porosity Reduction in Zinc Coated Steel Sheet Arc Welding for Automotive**

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FR-PO-51 Zinc Porosity Reduction Simulation of Tandem Arc Welding

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FR-PO-52 Development of Spot-Welding Quality Prediction System Using an Industrial Robot Based on Artificial Neural Network Algorithm

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FR-PO-53 Human-centered Product Development Framework: A Case Study on Smart-Textronics Products

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