International Conference Program

Measures against COVID-19

All delegates and exhibitors are requested to wear a mask during the entire period of the IIW2022 and its social events.

Sunday, 17 July

15:00-15:15 **International Conference Opening Ceremony** **Palais Royal A/B (B1F)**

Speech

(1) Chairman of the Conference Organizing Committee (Manabu Tanaka)

(2) Acting President of IIW (Dr. Sorin Keller)

15:15-17:15 **Plenary Session I**

Chairs: Stephan Egerland, Fronius International
Mitsuru Ohata, Osaka University

Keynote Lecture 1

Green Growth Strategy in the Context of Carbon Neutrality (tentative)
Shinichi Kihara
Deputy Director-General for Technology and Environment, Industrial Science and Technology Policy and Environment Bureau, METI, Japan

Keynote Lecture 2

[Houdremont Lecture]
MISSION NET ZERO: Initiatives of Mitsubishi Heavy Industries Group for Energy Transition
Eisaku Ito
Mitsubishi Heavy Industries, Ltd., Japan

Keynote Lecture 3

Additive Manufacturing: Building the Future One Layer at a Time
Josh Mook
GE Additive, USA

Keynote Lecture 4

Transformative Change in the Automotive Industry
Brian J. Krinock
Toyota Motor North America, USA

Monday, 18 July

8:30-10:30 **Plenary Session II** **Palais Royal A (B1F)**

Chairs: Robert E. Shaw, Jr., Steel Structures Technology Center, Inc.
Tomoya Kawabata, The University of Tokyo

Keynote Lecture 5

Renewable Energy Revolution by Power Generation with Floating Offshore Wind Turbine
Hideyuki Suzuki
The University of Tokyo, Japan

Keynote Lecture 6

Zero-emission Transition in Shipping
Hiroaki Sakashita
NIPPON KAIJI KYOKAI (ClassNK), Japan

Keynote Lecture 7

Towards the Future of Net-zero Aviation
Noriko Morioka
IHI Corporation, Japan

Keynote Lecture 8

Construction DX Initiatives
Shimz Smart Site
Next Generation Building construction System
Masahiro Indou
Shimizu Corporation, Japan

11:00-12:30 **[AM] Process Control** **Palais Royal A (B1F)**

Chairs: Abhay Sharma, KU Leuven
Soshu Kirihara, Osaka University

Invited Lecture 1

Innovative Aerospace and Space Structures made by Additive Manufacturing
Christoph Leyens[1,2], Frank Brückner[2,3], Elena López[2]
[1]Technische Universität Dresden, Institute of Materials Research, Germany, [2]Fraunhofer Institute for Material and Beam Technology IWS, Germany, [3]Department of Engineering Sciences and Mathematics, Luleå University of Technology, Sweden

A-1 **Controlled Droplet-on-Demand Deposition in Plasma–MIG Process: A Numerical Simulation Study**
Angshuman Kapil[1], Nithin Kayarthaya[2], Vatsalya Sharma[3], Patrick Van Rymenant[4], Abhay Sharma[1]
[1]KU Leuven, Faculty of Engineering Technology, Department of Materials Engineering, Campus de Nayer, Belgium, [2]KU Leuven, Faculty of Engineering Technology, Campus de Nayer, Belgium, [3]Centre for Mathematical Plasma Astrophysics (CmPA), KU Leuven, Belgium, [4]KU Leuven, Faculty of Engineering Technology, Department of Mechanical Engineering, Campus de Nayer, Belgium

A-2 **In-Situ Process Analysis of Laser Welding by Temporally and Spatially Mapped Radiation Reflection Measurements**
Moritz Wittemer, Andreas Wimmer, Katrin Wudy
Technical University of Munich, Germany

11:00-12:30 **[AI & DX] Automation of Welding Process** **Palais Royal B (B1F)**
Chairs: Satoru Asai, Osaka University
Ryoichi Tsuzuki, Kawasaki Heavy Industries, Ltd.

Invited Lecture 2
Evolution of Solutions Provided by i^3-Mechatornics - Sustainable Manufacturing Supported by Evolution of Robots -
Kazuhiro Haniya
Yaskawa Electric Corporation

D-1 **Automatic Welding with the Skilled Welding Operators Technique due to the Utilization of Image Processing and Machine Learning**
Yasutaka Banno[1], Kenta Nakao[2], Naoki Suda[3], Yasushi Nishijima[3], Mayu Kubo[1]
[1]Research & Innovation Center, Mitsubishi Heavy Industries, Ltd., Japan, [2]ICT solution Headquarters, Mitsubishi Heavy Industries, Ltd., Japan, 3Nuclear Energy Systems, Mitsubishi Heavy Industries, Ltd., Japan

D-2 **Automation of Welding Bead Length and Width Measurement by Semantic Segmentation and Image Recognition Algorithms**
Haruki Eguchi, Masashi Yoshida, Wanyu Tie, Michio Sakurai, Toru Sakai, Daichi Higashi, Yoshihiko Yagi
Panasonic Connect Co., Ltd., Japan

11:00-12:30 **[Hydrogen] Welding Process** **Palais Royal C (B1F)**
Chairs: Yoshiki Mikami, Osaka University
Hoyos Elizabeth, Universidad EIA

Invited Lecture 3
Technical Developments for Realization of Hydrogen Society, Focusing on Welding and Gas Cutting
Kunihiko Koike, Yoshifumi Yoshida, Hiroshi Tsujigami
Iwatani Corporation, Japan

H-1 **Vehicle to Arc (V2Arc) The High Efficiency Arc Welding/Cutting Eqipment Supplied Primary Power from Electric Vehicles**
Kosaku Yamaguchi
DAIHEN Corporation, Japan

H-2 **Identification and Feasibility Evaluation of a Friction Stir Welding Application in the Colombian Energy Sector**
Elizabeth Hoyos[1], Maria Camila Serna[1], Santiago Escobar[1], Jeroen De Backer[2]
[1]Universidad EIA, Envigado, Colombia, [2]TWI Technology Centre, Yorkshire, UK

11:00-12:30 **[Future Technology] Welding Process/NDT** **Palais Royal D (B1F)**

Chairs: Hiroyuki Shimizu, KOBE STEEL
Keiji Kadota, Daihen Corporation

Invited Lecture 4

Contribution to Carbon Neutrality by MHI Nuclear Engineering Systems and Supporting Welding Technology
Yurugi Kanzaki
Mitsubishi Heavy Industries, Ltd., Japan

F-1 **Nondestructive Detection of Unwelded Parts of T-joints by Magnetic Flux Leakage Testing with High Sensitivity Sensors**
Yohei Miyamoto[1], Mikihito Hirohata[1], Minoru Hayashi[2], Keiji Tsukada[2]
[1]Osaka University, Japan, [2]Okayama University, Japan

F-2 **Multi-faceted Evaluation of Dissimilar Joining between High Tensile Strength Steel Plate and Aluminum Plate using Useful New Non-destructive Method**
Yusuke Futamata, Tsuginosuke Hashimoto, Naoshi Kakio, Satoshi Yoshimi
Shimadzu Corporation, Japan

11:00-12:30 **[New Materials] Dissimilar Resistance Spot Welding** **Châtelet (B1F)**

Chairs: Kazuhiro Ito, Osaka University JWRI
Yu-Jun Xia, Shanghai Jiao Tong University

Invited Lecture 5

Structural Adhesive Bonding of Fiber Reinforced Composite Parts
Bernd Mayer[1,2], Holger Fricke[1]
[1] Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Germany, [2]Faculty of Production Engineering, University of Bremen, Germany

M-1 **MFDC Resistance Spot Welding of Aluminum to Steel / Effects of Welding Program Pulses, Electrode Shape and Polarity on Microstructure and Strength**
Mario Saeglitz, Sandra Jacobs
Hochschule Darmstadt, University of Applied Sciences, Germany

M-2 **Collaborative Simulation of Nugget Growth and Process Signals for Resistance Spot Welding**
Yu-Jun Xia[1], Tian-Le Lv[1], Hassan Ghassemi-Armaki[2], Yong-Bing Li[1], Blair E. Carlson[2]
[1]Shanghai Jiao Tong University, China, [2]General Motors Global R&D, USA

11:00-12:30 **[AM] Process 1** **Étoile (B1F)**

Chairs: Fiona Spirrett, Osaka University JWRI
Josh Mook, GE Additive

A-6 **New Approaches in Additive Manufacturing - The Final Steps in DED with Powder and Wire towards Guaranteed Quality and *First Time Right***
Markus Kogel-Hollacher[1], Christian Staudenmaier[1], Steffen Boley[2], Heinz-Ingo Schneider[3], Daniel Regulin[4]
[1]Precitec GmbH & Co. KG, Germany, [2]Institut für Strahlwerkzeuge, Universität Stuttgart, Germany, [3]Siemens AG Additive Manufacturing, Germany, [4]Siemens AG Functional Materials & Manufacturing Processes, Germany

A-7 **Development of Metal Additive Manufacturing Technology for Gas Turbine Hot Parts**
Shuji Tanigawa, Masaki Taneike, Ryuta Ito, Takanao Komaki, Norihiko Motoyama, Masahito Kataoka
Mitsubishi Heavy Industries, Ltd., Japan

A-8 **Determination of Shielding Gas for Multi-material Arc Directed Energy Deposition Additive Manufacturing**
Fereidoon Marefat[1], Aref banaee[2], Angshuman Kapil[1], Patrick Van Rymenant[3], Abhay Sharma[1]
[1]KU Leuven, Faculty of Engineering Technology, Department of Materials Engineering, Belgium, [2]KU Leuven, Faculty of Engineering Technology, Belgium, [3]KU Leuven, Faculty of Engineering Technology, Department of Mechanical Engineering, Belgium

11:00-12:30 **[Advanced Technology] Fatigue and Fracture 1** **Vendôme (B1F)**
Chairs: Hiroto Shoji, Osaka University
Sun Xing , TWI Ltd

Invited Lecture 6
Panasonic GREEN IMPACT for Manufacturers' Futures
Atsuto Shimada
Panasonic Connect Co., Ltd., Japan

O-1 **[Cancelled] Fatigue Testing And Modelling Of Flare Bevel Groove Welded Aluminum T-Joints**

O-2 **Ageing Effect on Fatigue Performance of Offshore Structures by Fracture Mechanics Method**
Xing Sun, Matthew Doré
Fatigue and Fracture Integrity Management, TWI Ltd. Cambridge, UK

11:00-12:30 **[AM] Modeling and Simulation 1** **Concerto (B1F)**
Chairs: Yosuke Ogino, Osaka University
Kiyokazu Yasuda, Osaka University

A-15 **[Cancelled] ANN Based Approach To Control The Dimensional Accuracy In Wire Arc Additive Manufacturing Process**

A-16 **Transition Strategy Optimization of Inconel625-HSLA Steel Functionally Graded Material Fabricated by Wire Arc Additive Manufacturing**
Jiarong Zhang[1], Xinjie Di[1,2], Chengning Li[1,2], Lingzhi Ba[1]
[1]Tianjin University, China, [2]Tianjin Key Laboratory of Advanced Joining Technology, China

A-17 **Surface Roughness of an Additively Manufactured AlSi10Mg Aluminum Alloy: Deep-Learning Based Prediction and Experimental Validation**
Waqas Muhammad[1,2], Jidong Kang[2], Olga Ibragimova[1], Kaan Inal[1]
[1]University of Waterloo, Canada, [2]CanmetMATERIALS, Canada

11:00-12:30 **[New Materials] Brazing Materials** **Harmonie (B1F)**

M-11 **[Cancelled] Study on Brazing Behavior of Diamond with Nickel Base Boron Free Solder**

M-12 **[Cancelled] Effects Of HF And Zr On Microstructure And Properties Of Ni-based Boron Free Solder And Brazed Diamond Joint**

M-13 **[Cancelled] Effect Of Cr Content On Microstructure, Melting Characteristics And Mechanical Properties Of Ni-based Boron Free Solder**

11:00-12:30 **[AM] Materials and Properties 1** **Fantaisie (B1F)**

Chairs: Shotaro Yamashita, Osaka University
Tao Yuan, Beijing University of Technology Faculty of Materials and Manufacturing

A-25 **Microstructure and Properties of TNZT-TiB2 Composite Processed by Laser-Powder Bed Fusion**

Rodolfo L. Batalha[1,2], Paulo J. Morais[1], Ana M. G. M. Cabral[1], Vitor Eduardo Pinotti[2], Omar O. S. Alnoaimy[3], Weverson C. Batalha[2], Tobias Gustmann[4], Konrad Kosiba[4], Simon Pauly[5], Claudemiro Bolfarini[2], Claudio S. Kiminami[2,] Piter Gargarella[2]

[1]Instituto de Soldadura e Qualidade, Porto Salvo, Portugal, [2]Federal University of São Carlos, São Carlos, Brazil, [3]Fraunhofer Institute for Machine Tools and Forming Technology, Dresden, Germany, [4]Leibniz Institute for Solid State and Materials Research Dresden, Dresden, Germany, [5]University of Applied Sciences Aschaffenburg, Aschaffenburg, Germany

A-26 **Effects of Notch-load-defect Interactions on the True Stress-logarithmic Strains and Strain Hardening of L-PBF 18Ni300**

Shahriar Afkhami[1], Kalle Lipiäinen[1], Vahid Javaheri[2], Mohsen Amraei[3,4], Antti Salminen[4], Timo Björk[1]

[1]Laboratory of Steel Structures, LUT University, Finland, [2]Materials and Mechanical Engineering, University of Oulu, Finland, [3]Laboratory of Laser Processing & Additive Manufacturing, LUT University, Finland, [4]Mechanical and Materials Engineering, University of Turku, Finland

A-27 **Inhomogeneous Formation of Microstructure in a Martensitic Stainless Steel during Wire Arc Additive Manufacturing**

Zhiwei Lyu[1], Yutaka S. Sato[1], Shun Tokita[1], Yue Zhao[2], Jinlong Jia[2], Aiping Wu[2]

[1]Tohoku University, Japan, [2]Tsinghua University, China

11:00-12:30 **[Future Technology] Friction Welding** **Menuet (B1F)**

Chairs: Hidetoshi Fujii, Osaka University
Javaheri Vahid, University of Oulu

F-6 **Linear Friction Welding of AA1050-H24 Joint and AA5052-H34 Joint**

Jeong-Won Choi[1], Weihao Li[2], Kohsaku Ushioda[2], Motomichi Yamamoto[1], Hidetoshi Fujii[2]

[1]Graduate School of Engineering, Hiroshima University, Japan, [2]Joining and Welding Research Institute, Osaka University, Japan

F-7 **[Cancelled] Effect of magnetizing parameters on friction stir welded steel plate using a micro-magnetic technique**

F-8 **[Cancelled] Evaluation of Tungsten Carbide Tool Material During Friction Stir Cladding of Copper on Steel Substrate**

11:00-12:30 **[Future Technology] High Power Beam 1** **Pensée (1F)**

Chairs: Yuji Sato, Osaka University
Oving Peter, TECHMETA Engineering

F-15 **Mitigation of Liquation Cracking in Laser Welding of Pairs of L-PBF Processed and Wrought Plates of Inconel 718**

Juan Simon-Muzas[1], Christian Brunner-Schwer[2], Michael Rethmeier[1,2,3], Kai Hilgenberg[1]

[1]Bundesanstalt fur Materialforschung und -prufung (BAM), Germany, [2]Fraunhofer Institute for Production Systems and Design Technology, Germany, [3]Institute of Machine Tools and Factory Management, Technische Universitat Berlin, Germany

F-16 **Development of Low Distortion Fillet Welding Technology Combining Hot-wire and High-power Diode Laser on 9%-NiSteel for LNG-fueled Ship**

Yuma Ozeki[1], Motoki Nakamura[1], Jeong-Won Choi[1], Motohiro Okushima[2], Suo Saruwatari[2], Manabu Mizumoto[3], Motomichi Yamamoto[1]

[1]Graduate School of Advanced Science and Engineering, Hiroshima University, Japan, [2]Plate & Construction Products Unit, Nippon Steel Corporation, Japan,[3]R&D Division, Nippon Steel Welding and Engineering Co., Ltd., Japan

F-17 **New Electron Beam Welding Technique to Weld Niobium SCRF Cavities from the Inside for Optimal Cavity Performance**

Peter Oving[1], Samuel De Sousa[1], Franck Oudot[1], Takeshi Dohmae[2], Akira Yamamoto[2]

[1]TECHMETA Engineering, France, [2]KEK, Japan

11:00-12:30 **[AI & DX] Education and Training** **Ginga (29F)**

Chairs: Satoshi Yamane, Saitama University
Schmelzer Aimée, Artwelding GmbH

D-6 **Step Change in Welding Simulation to Qualify Professional Welders at Siemens Mobility Krefeld (Germany) in the Regulated Rield of Welding Technology**

Michael Schumann[1], Antonio Claveria[2]

[1]Siemens Mobility, Germany, [2]Seabery Soluciones, Spain

D-7 **Worldwide Welder Shortage and Approaches to Overcome the Crisis**

A. Schmelzer[1], A. König[1], E. Margeta[2], A. Fernandez[3], F. Benus Jr.[4], Ž. Habek[5]

[1]SVS, Schweizerischer Verein für Schweisstechnik, Switzerland, [2]Industrijsko-obrtnička škola, Croatia, [3]Seabery, Spain, [4]Learn Virtual Europe, Hungary, [5]Udruga za cjeloživotno strukovno obrazovanje STRUKA, Croatia.

D-8 **Welding Simulators - Green Training for Top Welders**

E. Margeta[1], A. Fernandez[2] , F. Benus Jr.[3], A. Schmelzer[4], A. König[4], Ž. Habek[5]

[1]Industrijsko-obrtnička škola, Croatia, [2]Seabery, Spain, [3]Learn Virtual Europe, Hungary, [4]SVS, Schweizerischer Verein für Schweisstechnik, Switzerland, [5]Udruga za cjeloživotno strukovno obrazovanje STRUKA, Croatia

11:00-12:30 **[AI & DX] Automation** **Hikari (29F)**

Chairs: Fumikazu Miyasaka, Osaka University
Tomokazu Sano, Osaka University

D-13 **Vision-based AI-Algorithm for Seam Tracking and Distance Control of Fillet Welds in Gas Metal Arc Welding**

Mobina Mobaraki[1], Klaske Van Heusden[2], Ahmad Ashoori[4], Guy A. Dumont[1], Kwang Moo Yi[3], Amin Ghasemazar[4], Mahyar Asadi[4]

[1]Electrical and Computer Engineering Department, University of British Columbia, Canada, [2]Mechanical, School of Engineering, University of British Columbia, Canada, [3]Computer Science Department, University of British Columbia, Canada, [4]Novarc Technologies, Canada

D-14 **Application of Deep Learning to Seem Tracking in Plasma Arc Welding**

Jidong Lu, Ning Li, Satoshi Yamane

Graduate School of Science and Engineering, Saitama University, Japan

D-15 **Explainable Deep Learning for Welding Defect Detection**

Masashi Yoshida, Haruki Eguchi, Toru Sakai, Michio Sakurai, Yoshihiko Yagi

Panasonic Connect, Japan

11:00-12:30 **[Advanced Technology] Welding Residual Stress** **Niji (29F)**

Chairs: Hisaya Komen, Osaka University
Methong Titinan, King Mongkut's University of Technology Thonburi

O-13 **Numerical Study on the Effect of Peening Tool's Movement on Deformed Profile and HFMI-induced Residual Stresses**

Peiyuan Dai1, Phyo Myat Kyaw[1], Naoki Osawa[1], Sherif Rashed[2], Donghui Ma[3], Jun Okada[3], Masahito Honnami[3], Xiao Li[4]

[1]Osaka University, Japan, [2]CAE Lab, Japan, [3]Hitachi Zosen Corporation, Japan, [4]Xi'an Shiyou University, China

O-14 **Mechanism for Stress Relaxation and Long-term Stability of the Compressive Stress Introduced by WJP and Buffing Stress Improving Treatments**

Lina Yu[1], Kazuyoshi Saida[1], Kazutoshi Nishimoto[1], Naoki Chigusa[2]

[1]Osaka University, Osaka, Japan, [2]The Kansai Electric Power Co., Inc., Osaka, Japan

O-15 **Study on Joint Characteristics in Laser Butt Welding of AMed and Bulk Ti6Al4V Plates**

Yasuhiro Okamoto[1], Togo Shinonaga[1], Yoshito Takemoto[1], Akira Okada[1], Akihiro Ochi[1], Ryuya Kishimoto[1], Sisa Pityana[2], Nana Arthur[2], Peter Omoniyi[3,4], Rasheedat Mahamood[3,4], Martin Maina[5], Esther Akinlabi[3,6]

[1]Okayama University, Japan, [2]National Laser Centre, CSIR, South Africa, [3]University of Johannesburg, South Africa, [4]University of Ilorin, Nigeria, [5]Jomo Kenyatta University of Agriculture and Technology, Kenya, [6]Pan Africa University for Life and Earth Sciences Institute, Nigeria

11:00-12:30 **[Future Technology] Metallurgy** **Akatsuki (29F)**

Chairs: Kota Kadoi, Osaka University
Tomków Jacek, Gdansk University of Technology

F-25 **Effect of Water Salinity on Properties of Multipass Underwater Wet Welded Joints**
Jacek Tomków, Dariusz Fydrych, Jerzy Łabanowski
Gdańsk University of Technology, Faculty of Mechanical Engineering and Ship Technology, Poland

F-26 **Effect of Dilution Ratio in a Hard Facing Weld Metal on Solidification Cracking Susceptibility**
Jesada Kaewwichit[1], Rittichai Phaoniam[2], Bovornchok Poopat[1]
[1]Industrial and Manufacturing Systems Engineering, Department of Production Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Thailand, [2]Department of Mechanical and Industrial Engineering, Faculty of Engineering, Rajamangala University of Technology Krungthep, Thailand

F-27 **Laser Pressure Welding Induced Microstructure Associated with Corrosion Resistance of Al-Li Alloy 2198**
Tianbo Zhao[1,3], Yutaka S. Sato[1], Ting Huang[2], Rongshi Xiao[2]
[1]Department of Materials Processing, Graduate School of Engineering, Tohoku University, Japan, [2]High-Power and Ultrafast Laser Manufacturing Lab, Faculty of Materials and Manufacturing, Beijing University of Technology, China, [3]currently Fabrication Sect., Manufacturing Dept., Mitsui E&S Machinery Co., Ltd., Japan

11:00-12:30 **[Advanced Technology] Assessment** **Akane (29F)**

Chairs: Ninshu Ma, Osaka University
Jarmai Karoly, University of Miskolc

O-19 **Sustainability Assessment of Welding Processes: A Review**
Elisaveta Doncheva, Jelena Djokikj, Nikola Avramov, Martin Petreski, Aleksandra Krstevska
University of ss.Cyril and Methodius, Faculty of Mechanical Engineering – Skopje, Skopje, North Macedonia

O-20 **Transformation of Proprietary Welding Data Software from a PC-based Application to a Cloud-enabled Container Application using Standard Interfaces**
Timo Steinbring
Carl Cloos Schweißtechnik GmbH, Germany

O-21 **Calculation of the Welding Costs and Times using Various Heat Resistant Steels at Pressure Vessels**
Károly Jármai[1], Antal Erdős[2]
[1]University of Miskolc, Hungary, [2]BorsodChem Zrt., Hungary

14:00-16:00 **[AM] Materials and Properties 2** **Palais Royal A (B1F)**

Chairs: Tomokazu Sano, Osaka University
Soshu Kirihara, Osaka University

Invited Lecture 7
Opportunities in New Metallic Materials in Metal Additive Manufacturing
Moataz M. Attallah
University of Birmingham, UK

A-3 **Influence of Process Parameters on the Geometry, Microstructure and Properties of Waam Deposited High Strength Steel Walls**
A. Babu, E. Trodini, I. M. Richardson, M.J.M Hermans
TU Delft, Delft, Netherlands

A-4 **Directed Energy Deposition of Invar using Pre-alloyed Wire Compositions and Feasibility Study of In-situ Alloying using Fe and Ni Elemental Wires**
Romali Biswal[1], Goncalo Pardal[1], Craig Coppen[2], Stewart Williams[1]
[1]Cranfield University, UK, [2]Royal IHC limited, UK

A-5 **[Cancelled] Influence of Heat Treatment on the Microstructure and Hardness of 17-4PH ADAM Welded Stainless Steels**

14:00-16:00 **[AI & DX] Optimization and Management** **Palais Royal B (B1F)**
Chairs: Shinji Kodama, Nippon Steel Corporation
Kazuhiro Aoyama, The University of Tokyo

Invited Lecture 8
Paradigm Changes in the Welding Automation for Heavy Industry using Cutting-edge Digital Technologies
Yoshihide Inoue
Welding Business, KOBE STEEL, LTD., Japan

D-3 **Optimization of Welding Process and Factory Layout in Aero Engine Manufacturing**
Ryoichi Tsuzuki
Kawasaki Heavy Industries, Ltd. Aerospace System Company, Japan

D-4 **Toward Total Welding Quality Management System based on Shipbuilding Monitoring System**
Kazuhiro Aoyama[1], Chenwei Gui[1], Zeli Zhou[1], Hideaki Suetsugu[2], Byunghoo Jung[3], Mikito Shirai[4]
[a1]The University of Tokyo, Japan, [2]Namura Information System Co. Ltd, Japan, [3]Purdue University, USA, [4]MARINE NEXT Co., Ltd., Japan

D-5 **Development of Welding Operations Visualization Technology for Acceleration of Digital Transformation in Heavy Industrial Factory**
Kasano Kazuki, Matsui Rintaro
Sumitomo Heavy Industries, LTD., Japan

14:00-16:00 **[Hydrogen] Mechanical Behavior** **Palais Royal C (B1F)**
Chairs: Tomoya Kawabata, The University of Tokyo
Gaspar Marcell, University of Miskolc

Invited Lecture 9
International Liquefied Hydrogen Supply Chain
Katsuya Morimoto
Kawasaki Heavy Industries, Ltd., Japan

H-3 **Deterioration of HAZ Toughness by Residual Sn and Its Allowable Content for Electric Furnace Steels**
Tomoya Kawabata[1], Saki Hayashi[1], Masayuki Yoshimoto[2], Masayuki Yamamoto[2], Toshiyuki Numata[3], Kouji Yamada[3]
[1]The University of Tokyo, Japan, [2]Chubu Steel Plate Co., Ltd., Japan, [3]FaB-Tec Japan Corporation, Japan

H-4 **Effect of Stress Field on TRIP Behavior and Its Influence on Fracture Behavior of Commercial Stainless Steels at Cryogenic Temperature**
Ritsuki Morohoshi, Tomoya Kawabata
The University of Tokyo, Japan

H-5 **Physical Simulation Based HAZ Characterization of Different Pipeline Steel Grades**
Marcell Gáspár, Raghawendra Sisodia
University of Miskolc, Institute of Material Science and Technology, Hungary

14:00-16:00 **[Future Technology] Welding for Thick Plate** **Palais Royal D (B1F)**
Chairs: Motomichi Yamamoto, Hiroshima University
Shigetaka Okano, Osaka University

Invited Lecture 10
Forefront of ITER Project, the Dream Nuclear Fusion Energy
Masanori Mochimaru
Toshiba Energy Systems & Solutions Corporation, Japan

F-3 **Application of High-precision Assembly Technology for Large Structures by Laser Beam Welding**
Tomoyuki Nishiyama, Takashi Kagawa, Shuho Tsubota, Masahiro Kimura
Mitsubishi Heavy Industries, Ltd., Japan

F-4 **Development of Narrow-gap Welding for Ultra-thick Cast Steel Using Hot-wire Method and High-power Diode Laser**
Keita Marumoto[1], Yuta Sato[1], Akira Fujinaga[2], Taleshi Takahashi[2], Hikaru Yamamoto[2], Jeong-Won Choi[1], Motomichi Yamamoto[1]
[1]Hiroshima University, Japan, [2]Hitachi Construction Machinery Co., Ltd., Japan

F-5 **The Optimization of High-Efficiency and Low Heat Input Hot-wire Gas Metal Arc Welding for Thick Steel Plate in Shipbuilding Industry**
Nattasak Suwannatee[1], Somchai Wongthaisong[2], Rittichai Phaoniam[2], Shinichiro Shinohara[3], Jeong-Won Choi[1], Motomichi Yamamoto[1]
[1]Hiroshima University, Japan, [2]Rajamangala University of Technology Krungthep, Thailand, [3]Tsuneishi Shipbuilding Co., Ltd, Japan

14:00-16:00 **[New Materials] Steel Welds** **Châtelet (B1F)**
Chairs: Hiroaki Mori, Osaka University
Raghawendra Pratap Singh Sisodia, University Of Miskolc

Invited Lecture 11
New Stainless Steel HRX19® with both High Strength and Superior Hydrogen Embrittlement Resistance for High Pressure Hydrogen Gas Application
Takahiro Osuki[1], Kana Jotoku[1], Jun Nakamura[1], Tomohiko Omura[1], Takahiro Izawa[1], Hiroyuki Hirata[2]
[1]Nippon Steel Corporation, Japan, [2]Osaka University, Japan

M-3 **Simulated Heat Affected Zone Ferrite Content Influence on Toughness for Standard Duplex and New Duplex Stainless Steel Grade with Enhanced Weldability**
Anne Higelin[1], Sandra Le Manchet[1], Gilles Passot[1], John Grocki[2]
[1]Centre de Recherche des Matériaux au Creusot, Industeel – ArcelorMittal, France, [2]Industeel-ArcelorMittal USA

M-4 **A Study on Creep and Mechanical Properties at High Temperature of SMAW Welds for Modified Cr-Mo-X Steel**
Sanghyun Bae[1], Yongchul Kim[1], and Stephen Liu[2]
[1]KISWEL R&D Center, South Korea, [2]Colorado School of Mines, U.S.A.

M-5 **The Influence of Filler Material on Microstructural and Mechanical Properties of Diode Laser Welded DP1000**
Raghawendra Sisodia, Marcell Gáspár
Institute of Materials Science and Technology, University of Miskolc, Hungary

14:00-16:00 **[AM] Process 2** **Étoile (B1F)**

Chairs: Houichi Kitano, National Institute for Materials Science
Fiona Spirrett, Osaka University

A-9 **Process Integrated Closed-loop Control in Wire-Arc-Additive-Manufacturing**
Lennart Vincent Hölscher, Thomas Hassel, Hans Jürgen Maier
Institut für Werkstoffkunde (Materials Science), Leibniz Universität Hannover, Germany

A-10 **Parametric Study of Melt Pool Geometry in Hybrid Plasma Arc-laser Melting Process for Additive Manufacturing Application**
Chong Wang, Wojciech Suder, Jialuo Ding, Stewart Williams
Cranfield University, UK

A-11 **Cold Metal Transfer-based Twin Wire Arc Additive Manufacturing of Iron Aluminides**
Tirupataiah Kasani, Nasina Venkaiah, Degala Venkata Kiran
Indian Institute of Technology Tirupati, India

A-12 **Experimental and Theoretical Analysis of Heat Accumulation in Laser Wire Direct Energy Deposition**
Christian Hagenlocher[1,2], Patrick O'Toole[1], Steffen Boley[2], Wei Xu[1,3], Milan Brandt[1], Mark Easton[1], Andrey Molotnikov[1]
[1]RMIT Centre for Additive Manufacturing, RMIT University, Australia, [2]Institut für Strahlwerkzeuge, University of Stuttgart, Germany, [3]School of Engineering, Deakin University, Australia

14:00-16:00 **[Advanced Technology] FSW** **Vendôme (B1F)**

Chairs: Yutaka Sato, Tohoku University
Hoyos Elizabeth, Universidad EIA

Invited Lecture 12

Challenge to Welding and Joining Technology for Applying Multi-Material in Electric Vehicle Production
Tomoyuki Ueyama[1], Shinichi Hasegawa[1], Testuo Era[1], Hidetoshi Fujii[2]
1DAIHEN (OTC) Corporation, Japan2Joining and Welding Research Institute Osaka University, Japan

O-3 **Evaluation Strategy via Comparison of a Heat-input Model for the Friction Stir Welding Process**
Sara Montoya[1], Laura M. Moreno-Durango[1], Elizabeth Hoyos[1], Yesid Montoya[1], Hernan Alvarez[2]
[1]Universidad EIA, [2]Envigado, Colombia, Universidad Nacional de Colombia, Colombia

O-4 **Study on the Vertical Material Flow and Influencing Factors during Friction Stir Welding of Aluminium Alloys**
Yang Han, Shujun Chen, Xiaoqing Jiang
Beijing University of Technology, China

O-5 **Avoiding Void Formation in Friction Stir Welding of High Hard Armor (HHA) Steel**
Paul Lyda, Rafael Giorjao, Antonio J. Ramirez
Ohio State University, USA

14:00-16:00 **[AM] Modeling and Simulation 2** **Concerto (B1F)**
Chairs: Katsuya Kugai, KINDAI University Technical College
Fumikazu Miyasaka, Osaka University

A-18 **Composite Bead Models for Capturing Process Complexities in Weld-Deposition Based Additive Manufacturing**
Angshuman Kapil, Abhay Sharma
KU Leuven, Faculty of Engineering Technology, Department of Materials Engineering, Campus de Nayer, Belgium

A-19 **Design of Biomimetic Prickles for Heterogenous Joints by Additive Manufacturing**
Kiyokazu Yasuda, Riku Miura, Tai Wang
Osaka University, Japan

A-20 **Avoiding False Detection of Arc Sensors in Short-circuit Transitions –Quantification of Welding Phenomena in the Absence of Instability Factors –**
Katsuya Kugai, Nobuhiro Nakamura
Kindai University Technical College, Japan

A-21 **Development of Numerical Model for LFW Process Model by Particle Method**
Toya Kitamura, Fumikazu Miyasaka
Osaka University, Japan

14:00-16:00 **[New Materials] Other Processes** **Harmonie (B1F)**
Chairs: Shinji Fukumoto, Osaka University
Wataru Takahara, Osaka University

M-14 **Deteriorated Characteristics on the Fatigue Strength of Dissimilar A6061/ Galvannealed Steel Joints Fabricated by Friction Stir Spot Welding**
A.Toshimitsu Yokobori, Jr[1], Toshihito Ohmi[1,2], Go Ozeki[1], Ikuo Shohji[3], Tsutomu Katsumata[4]and Toru Matsubara[4]
[1]Advanced Comprehensive Research Organization Teikyo University, Japan, [2]Department of Mechanical Engineering Shonan Institute of Technology, Japan, [3]Graduate School of Science and Technology, Gunma University, Japan, [4] Palmeso co.jp, Japan

M-15 **Dissimilar and Hybrid Structures Via Magnetic Pulse Welding**
S. Marya, G. Racineux
Research Institute in Civil and Mechanical Engineering, Ecole Centrale de Nantes, France

M-16 **[Cancelled] Optimization Of Ti/Al Interface Zone At TA2/A5150 Joints By Growing K2Ti6O13 Whiskers On Titanium Surface**

M-17 **Partial Cleaning of Aluminium Sheet Surfaces for Thermal Joining**
Daniel Rudolph
Audi AG, Germany

14:00-16:00 **[AM] Defects** **Fantaisie (B1F)**

Chairs: Bernd Mayer, Fraunhofer Institute for Manufacturing Technology and Advanced Materials
Patrick O'Toole, RMIT
Kota Kadoi, Osaka university

A-28 **Microstructure and Cracking in WAAM'ed Aluminium Alloys by Integrated Analytical and Process Modelling**
Patrick O'Toole[1], Alexandra Kingsbury[1], Johannes Kronsteiner[2], Hugo Drexler[2], Mark Easton[1], Andrey Molotnikov[1], Amir Horr[2], Martin Bielik[3]
[1]RMIT Centre for Additive Manufacturing, RMIT University, Australia, [2]Light Metals Technologies LKR, Austrian Institute of Technology, Austria, [3]RHP-Technology GmbH, Automotive, Austria

A-29 **Research on the Mechanism of Liquation Cracks in Wire-Arc Additive Manufacturing of Aluminum Alloy**
Min Xu, Shujun Chen, Tao Yuan
Institute of Intelligent Forming Equipment and System, Faculty of Materials and Manufacturing, Beijing University of Technology, China

M-6 **Fabrication of micron-sized protrusions on metal surface for metal/polymer easy disassembly joining by selective laser melting technology**
Tai Wang[1], Kiyokazu Yasuda[1], Hiroshi Nishikawa[2]
[1]Materials and Manufacturing Science Division, Graduate School of Engineering, Osaka University, Japan, [2]Joining and Welding Research Institute, Osaka University, Japan

M-7 **Welding Repair for Ni Base Superalloy**
Masahiko Mega, Koji Tsukimoto, Shuji Tanigawa, Sachio Shimohata,Masashi Kitamura
Manufacturing Technology Research Department, Research & Innovation Center, Mitsubishi Heavy Industries, Ltd., Japan

14:00-16:00 **[Future Technology] Arc Welding Process** **Menuet (B1F)**

Chairs: Hisashi Serizawa, Osaka University
Shinichi Tashiro, Osaka University

F-9 **Development of Highly Productive Welding Process for Stainless-steel using High-current GMAW**
Tomoya Igarashi[1], Hayato Baba[1], Keiji Kadota[1], Tetsuo Era[1], Tomoyuki Ueyama[1], Manabu Tanaka[2]
[1]Welding Research Department, Welding & Joining Division, DAIHEN Corporation, Japan, [2]Joining and Welding Research Institute, Osaka University, Japan

F-10 **Influence of Metal Deposition Modes on The Side Wall Fusion and Properties of Narrow Gap Gas Metal Arc Welded Joints**
Sudheer Kumar Polamuri, Degala Venkata Kiran, Nasina Venkaiah
Indian Institute of Technology Tirupati, India

F-11 **[Cancelled] Effect of Electrode Tip Angle on Penetration, Bead Width, Distortion, and Atmospheric Contamination During Pulse GTA Welding of Grade-2 Titanium Alloy (CP-Ti)**

O-9 **Measurement of Electron Density Distribution of AC-GTA in like Mars Atmosphere**
Kai Aoyama[1], Shinichiro Shobako[1], Tomohiko Yamashita[1], Noboru Terajima[1], Hisaya Komen[2], Manabu Tanaka[2]
[1]National Institute of Technology Kagawa College, Japan, [2]Joining and Welding Research Institute, Osaka University, Japan

14:00-16:00 **[Future Technology] High Power Beam 2** **Pensée (1F)**
Chairs: Christoph Leyens, Fraunhofer Institute for Material and Beam Technology
Lind Jannik, University of Stuttgart IFSW
Yuji Sato, Osaka University

F-18 **Superimposed Intensity Distributions to Reduce Spatter Formation at High Feed Rates during Laser Welding**
Jannik Lind[1,2], Michael Jarwitz[1], Christian Hagenlocher[1], Jonas Wagner[1], Rudolf Weber[1], Thomas Graf[1]
[1]Institut für Strahlwerkzeuge (IFSW), Germany, [2]Precitec GmbH & Co. KG., Germany

F-19 **Electron Beam Welding of Copper Electrical Conductors for Electric Vehicles**
Alex O'Farrell
Cambridge Vacuum Engineering, UK

F-20 **Interaction of Protective Gas with Process Emissions in Vacuum Laser Welding**
Max Nentwich[1], Alex O'Farrell[2], Wojciech Suder[1]
[1]Cranfield University, UK, [2]Cambridge Vacuum Engineering, UK

F-21 **Influence of Beam Shaping on the Process Efficiency during Laser Welding**
Jonas Wagner[1], Christian Hagenlocher[1], Jannik Lind[1], Rudolf Weber[1], Nina Armon[2], Roey Susid[2], Oded Tsiony[2], Eyal Shekel[2], Thomas Graf[1]
[1]Institut für Strahlwerkzeuge (IFSW), Germany, [2]Civan Advanced Technologies Ltd., Israel

14:00-16:00 **[AI & DX] Inspection** **Ginga (29F)**
Chairs: Kazufumi Nomura, Graduate School of Engineering Osaka University
Satoyuki Tanaka, Hiroshima University

D-9 **Application of Phased Array Ultrasonic Testing for Tube-to-Tubesheet Weld of Heat Exchanger using Deep Learning**
Kaoru Shinoda[1], Masamitsu Abe[1], Takeru Katayama[1], Ryota Ioka[2], Takahiro Wada[2], Naoto Shinmura[3], Joichi Murakami[4], Hiroshi Hattori[5]
Carbon Neutral Solution Business Headquarters, Hitachi Zosen Corporation, [1]Kumamoto, Japan, [2]R & D Headquarters, Hitachi Zosen Corporation, Osaka, Japan, [3]Kyusyu Division, Nichizo Tech Inc., Kumamoto, Japan, [4]Technical Consulting Headquarters, Nichizo Tech Inc., Osaka, Japan, [5]Technical Development Department, Nichizo Tech Inc., Osaka, Japan

D-10 **Study of Fracture Behaviours on a Tube-to-Tubesheet Weld Joint for a Heat Exchanger**

Thin Thin Htut[1], Satoyuki Tanaka[1], Donghui Ma[2], Jun Okada[2], Masahito Honnami[2], Kaoru Shinoda[3], Masamitsu Abe[3], Takeru Katayama[3]

[1]Graduate School of Advanced Science and Engineering, Hiroshima University, Japan, [2]R & D Headquarters, Hitachi Zosen Corporation, Japan, [3]Carbon Neutral Solution Business Headquarters, Hitachi Zosen Corporation, Japan

D-11 **A Study for Automatic Inspection of Leg Length and Undercut in the T-shaped Joint using Deep Learning**

Norihiro Watanabe[1,2], Kento Yamasaki[1], Koji Gotoh[2]

[1]Oshima Shipbuilding Co., Ltd, Japan, [2]Kyushu University, Japan

D-12 **In-line Detection of Internal Defects for Lap Joint welding of Galvanized Steel Sheet by Laser Ultrasonic Technique**

Keiji Kadota[1,2], Taketo Matsuida[3], Kazufumi Nomura[3], Tetsuo Era[1,2], Satoru Asai[2]

[1]Daihen corporation, Japan, [2]Joining and Welding Research Institute, Osaka University, Japan, [3]Graduate School of Engineering, Osaka University, Japan

14:00-16:00 **[AI & DX] Prediction of Weld Quality** **Hikari (29F)**

Chairs: Hidenori Terasaki, Kumamoto University
Satoshi Minamoto, National Institute for Materials Science

D-16 **Development of Analysis Method to Predict Creep Life from Welding Process and Study of Appropriate Heat Source Parameters**

Kesisuke TORIGATA[1], Takaaki MATSUOKA[1], Daisuke ABE[2], Hitoshi IZUNO[3], Masahiko DEMURA[3]

[1]IHI Corporation Technology & Intelligence Integration, Japan, [2]IHI Corporation Human Resources, Japan, [3]National Institute for Materials Science Research and Services Division of Materials Data and Integrated System, Japan

D-17 **Optimization of HAZ Shape Factors by Bayesian Inference for Creep Performance Improvement of Heat-Resistant Steel Welded Joint**

Hitoshi Izuno[1], Masahiko Demura[1], Masayoshi Yamazaki[1], Yoh-ichi Mototake[2], Kenji Nagata[3], Daisuke Abe[4], Keisuke Torigata[5]

[1]Research and Services Division of Materials Data and Integrated System, National Institute for Materials Science, [2]The Institute of Statistical Mathematics, [3]Materials Data Platform Center, National Institute for Materials Science, [4]Human Resources, IHI Corporation, [5]Technology & Intelligence Integration, IHI Corporation

D-18 **Optimization of Process Conditions to Maximize Creep Rupture Time in Steel Welds**

Satoshi Minamoto, Koyo Daimaru, Hitoshi Izuno, Masahiko Demura

National Institute for Materials Science (NIMS), Japan

D-19 **Establishment of Process–structure–property Linkage for Generation of Virtual Micrograph using Deep Learning Method**

Satoshi Noguchi, Junya Inoue

The University of Tokyo, Japan

14:00-16:00 **[AI & DX] Skill Evaluation of Welders** **Niji (29F)**

Chairs: Koutarou Inose, IHI Corporation
Koji Gotoh, Kyushu University

D-23 **Beginners' Welding Plate Evaluation Using Convolutional Neural Network**
Shigeru Kato[1], Shunsaku Kume2, Takanori Hino[1], Tomomichi Kagawa[1], Hajime Nobuhara[2], Hironori Kumeno[1]
[1]Niihama-College, National Institute of Technology, Japan, [2]University of Tsukuba, Japan

D-24 **Sensing of Welder's Motion and Its Relationship with Welding Quality for Semi-Automatic Arc Welding**
Kazutoshi Sugie[1], Tanaka Akihide[2], Takahashi Isamu[1], Okizaki Naoya[1], Miyagi Masanori[1], Seung Hwan C. Park[1]
[1]Research & Development Group, Hitachi, Ltd., Japan, [2]Industry & Distribution Business Unit, Hitachi, Ltd., Japan

D-25 **Development of a Prototype 3D Measuring and Judging System to Improve the Accuracy of Visual Inspection of Weld Bead Appearance and to Digitise Inspection Results for Welder Qualification Tests**
Tomoya Uchimura[1], Yosuke Koba[1], Tomomichi Simizu[2], Junichi Hirata[2], Hiroyuki Kobayashi[2], Koji Gotoh[1]
1Kyushu University, Japan, [2]Nippon Kaiji Kyokai (ClassNK), Japan

D-26 **Effect of Torch Movement on Weld Quality in Wemi-automatic CO_2 Arc Welding**
Ryo Hasegawa, Taiki Kato, Shoji Sasaki, Hiroshi Murai
Aomori Prefectural Industrial Technology Research Center, Hachinohe Industrial Research Institute, Aomori, Japan

14:00-16:00 **Special Session for Young Professionals** **Akatsuki (29F)**

Chair: Shun Tokita, Tohoku University

YP-1 **Introduction of Young Professional Group in JWS (WELNET) and Current Stage of the Numerical Simulation Technique of Arc Welding Process**
Yosuke Ogino
Graduate school of Engineering, Osaka University, Japan

YP-2 **Optimization of Powder Catchment Efficiency in Welding and Additive Manufacturing**
M. R. Grams1,2, G. Wood2, P. F. Mendez1
[1]University of Alberta, Edmonton, Canada, [2]Apollo-Clad Laser Cladding, Leduc, Canada

YP-3 **A Novel Hybrid Welding Process to Improve the Welded Joint Quality of Aluminum Alloys**
Titinan Methong
Department of Production Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Thailand

16:30-17:30 **IC-WUs Panel Discussion** **Palais Royal D (B1F)**

Chair: Stephan Egerland

Overview of WUs by TMB Chairman:	Stephan Egerland
Activity from Group 1 (Processes):	Jorge dos Santos
Activity from Group 2 (Structural integrity):	Majid Farajian
Activity from Group 3 (Industry support):	Carl Peters

Proposal from IIWWG-YP: Kittichai Sojiphan
Proposal from Special Session for YP: Hiroto Shoji
The future strategy of WUs by TMB Chairman: Stephan Egerland

16:30-18:00 **[Hydrogen] Material Behavior** **Châtelet (B1F)**

Chairs: Yoshiki Mikami, Osaka University
Tianbo Zhao, Mitsui E&S Machinary Co., Ltd.

H-6 **Effect of Welding Parameters on Delayed Cracking of Welded Type 630 Stainless Steel**
Tianbo Zhao, Koki Maeda, Shozo Ono
Manufacturing Dept., Mitsui E&S Machinery Co., Ltd., Japan

H-7 **Experimental Set-up for In-situ Measurement of Hydrogen Diffusion during GMAW Operation**
Blanc Nicolas[1], Soulié Fabien[1], Delmas Josselin[2] Robin Vincent[2], Bordreuil Cyril[1]
[1]Laboratoire de Mecanique et Genie Civil, Universite de Montpellier, CNRS, France, [2]EDF–R&D,Département PRISME Performance, Risque Industriel, Surveillance pour la Maintenance et l'Exploitation, France

H-8 **Electron Beam Brazing and Welding Of Components For Wendelstein 7-X Facing The High Energy Plasma**
Guido Reuter, Hannes Kendziora
PTR Strahltechnik GmbH, Germany

16:30-18:00 **[AM] Other Topics** **Étoile (B1F)**

Chairs: Hisaya Komen, Osaka University
Antti Salminen, University of Turku

Invited Lecture 13
Qualification Pathways for Additively Manufactured Metallic Components –Basic Research to Deployment
Sudarsanam Suresh Babu
University of Tennessee, Knoxville, USA

A-13 **A Comparative Study of the Carbon Footprint of Am-Based Remanufacturing vs. Traditional Machining of Metal Components**
Michel Honoré[1], Peter T. Nielsen[1], Søren Kølle Hansen[2]
[1]FORCE Technology, Denmark, [2]Danish AM-Hub, Denmark

A-14 **Investigations Into The Processability Of Glass Materials By Additive Manufacturing Techniques**
Fiona Spirrett[1], Ruth Goodridge[2], Ian Ashcroft[2], Kyriaki Datsiou[1,2], Soshu Kirihara[1]
[1]Osaka University, Osaka, Japan, [2]University of Nottingham, Nottingham, UK

16:30-18:00 **[Advanced Technology] Laser Process** **Vendôme (B1F)**

Chairs: Shotaro Yamashita, Osaka University
Ebrahimi Amin, Delft University of Technology

O-6 **Reduction of Porosity in Laser Arc Hybrid Welding of Aluminum Alloys**
Noriyuki Matsuoka, Yutaro Shintome, Toshiyuki Mishima, Michio Sakurai
Panasonic Connect Co., Ltd., Japan

O-7 **Bead Shape Effect On Solidification Cracking During Hot-wire Laser Welding On Narrow-gap Joint of Ni-base Alloy**
Kenshi Arima, Jeong-Won Choi, Motomichi Yamamoto
Graduate School of Advanced Science and Engineering, Hiroshima University, Japan

O-8 **Numerical Study of the Effects of Laser Beam Shaping on Molten Metal Flow Behaviour in Laser Melting**
Amin Ebrahimi, Ian M. Richardson, Marcel J.M. Hermans
Department of Materials Science and Engineering, Delft University of Technology, The Netherlands

16:30-18:00 **[AM] Process 3** **Concerto (B1F)**
Chairs: Shun Tokita, Tohoku University
Katsuya Kugai, KINDAI University Technical College

A-22 **Wire-based Laser Direct Energy Deposition Process for Nuclear Equipment**
Yasutaka Banno[1], Hironobu Tanaka[1], Shuho Tsubota[1], Yasuyuki Fujiya[1], Masahiro Kimura[2]
[1]Research & Innovation Center, Mitsubishi Heavy Industries, Ltd., Japan, [2]Nuclear Energy Systems, Mitsubishi Heavy Industries, Ltd., Japan

A-23 **Effect of the Location on the Fracture Toughness of Wire Arc Additively Manufactured Components Using Different Welding Wires**
Kadir Dağyıkan, Uğur Gürol, Mustafa Koçak
İstanbul Gedik University, Istanbul, Turkey, [b]Gedik Welding Inc., Istanbul, Turkey

A-24 **[Cancelled] Effect of Friction Stir Processing on Microstructure and Mechanical Properties of Al-Cu Alloy Produced by Wire Arc Additive Manufacturing**

16:30-18:00 **[New Materials] Simulation and Calculation** **Harmonie (B1F)**
Chairs: Kunio Takahashi, Tokyo Institute of Technology
Wataru Takahara, Osaka University

M-18 **Computation of Distortions in Steel-Aluminum Joints**
Anton Evdokimov, Ralf Ossenbrink, Nikolay Doynov, Vesselin Michailov
Brandenburg University of Technology, Germany

M-19 **Tensile Behaviour of the Weld HAZ in Ultra-high Strength Steels**
Mohsen Amraei[1], Shahriar Afkhami[2], Vahid Javaheri[3], Antti Salminen[1], Xiao-Ling Zhao[4], Timo Björk[2]
[1]Department of Mechanical and Materials Engineering, University of Turku, Finland, [2]Laboratory of Steel Structures, LUT University, Finland, [3]Materials and Mechanical Engineering, University of Oulu, Finland, [4]Department of Civil and Environmental Engineering, The Hong Kong Polytechnic University, China

M-20 **A Method to Evaluate Liquid Surface Tension from a Shape of Sessile Drop in Gravity**
Kunio Takahashi
Tokyo Institute of Technology, Japan

16:30-18:00 **[New Materials] Dissimilar FSW** **Fantaisie (B1F)**

Chairs: Tomoki Matsuda, Osaka University
Sviatoslav Motrunich, E.O. Paton Electric Welding Institute of the National Academy of Sciences of Ukraine

M-8 **[Cancelled] Effect of Alloy Element Content on Properties of Aluminum/Steel Filled Friction Stir Welded Joints**

M-9 **[Cancelled] Study on the Effect of Ce Content on the Friction Stir Welding with Filler Wire Welded Joints Performance of Aluminum Alloy and Steel**

M-10 **Fatigue Life of Thin Sheet Joints of Dissimilar AA2024 and AA5056 Produced by Friction Stir Welding Technology**
Sviatoslav Motrunich, Illia Klochkov, Anatoliy Poklaytsky, Viktor Fedorchuk
Paton Welding Institute, Kyiv, Ukraine

16:30-18:00 **[Future Technology] Other Dissimilar Joint** **Menuet (B1F)**

Chairs: Hajime Yamamoto, Osaka University
Dejans Arnout, KU Leuven, Department of Mechanical Engineering

F-12 **Dissimilar Joining of Mg/Al Light Metals by Explosive Welding**
Mami Mihara-Narita[1], Konosuke Asai[1], Hisashi Mori[2], Yasumasa Chino[3], Hisashi Sato[1], Yoshimi Watanabe[1]
[1]Nagoya Institute of Technology, Japan, [2] UACJ Corporation, Japan, [3]National Institute of Advanced Industrial Science and Technology, Japan

F-13 **Copper-Aluminium Joining by Novel Locked Projection Welding Process**
Arnout Dejans, David Moens, Patrick Van Rymenant
KU Leuven, Dept. of Mechanical Engineering, Belgium

F-14 **Development of Metal and Thermoplastic Dissimilar Materials Joining using Laser Process**
Takaaki Miyauchi, Ryoji Tamaki, Shinichi Hasegawa, Tomoyuki Ueyama
Dept. of joining Technology Development, DAIHEN Corporation, Japan

16:30-18:00 **[Future Technology] Resistance Welding** **Pensée (1F)**

Chairs: Muneyoshi Iyota, Osaka Institute of Technology
Mikno Zygmunt, Lukasiewicz Research Network, Instytut Spawalnictwa

F-22 **Development of Resistance Spot Welding Technology Applying Adaptive Control for Narrow Pitch Spot Welding**
Chikaumi Sawanishi, Yasuaki Okita, Katsutoshi Takashima
JFE Steel Corporation, Japan

F-23 **Microstructure and Mechanical Properties of Ring Mash Welding in Chromium Molybdenum Steel**
Yasuo Kadoya[1], Yuki Oshino[1], Hironobu Nishimura[1], Satoshi Yamane[2]
[1]Origin Co.Ltd., Japan, [2]Saitama University, Japan

F-24 **Resistance Projection Welding of Nuts with Respect to Projection Height**
Zygmunt Mikno, Szymon Kowieski
Sieć Badawcza Łukasiewicz /Łukasiewicz Research Network/ - Instytut Spawalnictwa; Poland

16:30-18:00 **[Advanced Technology] Fatigue and Fracture 2** **Ginga (29F)**

Chairs: Kazuma Shimizu, Osaka University
Lina Yu, Osaka University

O-10 **Fatigue Strength of Weld Root at Ship Structural Joints**
Norio Yamamoto[1], Toshihiro Fujii[2]
[1]Nippon Kaiji Kyokai, Japan, [2]Oshima Shipbuilding, Japan

O-11 **Numerical and Experimental Evaluation on Residual Stress Related to Fatigue Life at the Weld Root of Plug Joint**
Yukihide Yoshihara[1], Naoki Osawa[1], Hidekazu Murakawa[2]
[1]Osaka University, Japan, [2]Joining and Welding Research Institute of Osaka University, Japan

O-12 **Revealing Ductile-to-brittle Transition Mechanism and Enhancing the Cryogenic Ductility of Tin (Sn) for Cryogenic Electronics**
Xiaoliang Ji[1,2], Rong An[2], Wei Zhou[1],Yishu Wang[1], Fu Guo[1,3,4], Chunqing Wang[2]
[1]Faculty of materials and manufacturing, Beijing University of Technology, Beijing, China, [2]State Key Laboratory of Advanced Welding and Joining, Harbin Institute of Technology, Harbin, China, [3]Key Laboratory of Advanced Functional Materials, Beijing University of Technology, Beijing, China, [4]College of Robotics, Beijing Union University, Beijing, China

16:30-18:00 **[AI & DX] Sensing of Weld Quality** **Hikari (29F)**

Chair: Kazufumi Nomura, Graduate School of Engineering Osaka University

D-20 **Robust Device for Observation and Classification of Weld Pool Behavior**
T.Boutin[1,2], I.Bendaoud[1] , J.Delmas[2] , D.Borel[2], C.Bordreuil[1]
[1]University of Montpellier, France, [2]EDF R&D, France

D-21 **Weld Appearance Inspection of Excess Metal Using DETR**
Taiga Ishikawa, Kotaro Kii, Hironori Kumeno, Daisuke Tanaka, Takanori Hino, Shigeru Kato
National Institute of Technology, Niihama College, Japan

D-22 **A Study on Quality Control Utilizing Stress Concentration Factor of Welded Joints Calculated with On-site Measurement Data for Chemical Tanker Construction**
Hironori Ogata[1], Yuichi Yamamoto[1], Hiromi Ando[1], Masayuki Kaneko[1], Ryotaro Muta[1], Kazuyuki Matsumoto[2], Motomichi Yamamoto[3], Tadakazu Tanino[4], Hiroshi Yajima[5]
[1]USUKI SHIPYARD CO., LTD., Japan, [2]Nippon Kaiji Kyokai, Japan, [3]Hiroshima University, Japan, [4]National Institute of Technology, Kurume College, Japan , [5]Yajima Material Integrity Laboratory, Japan

16:30-18:00 **[Advanced Technology] Measurement and Inspection** **Niji (29F)**

Chairs: Shinichi Tashiro, Osaka University
Vairis Achilles , Hellenic Mediterranean University

O-17 **Evaluation Of Large-Scale Diffusion Bonded Interfaces By Means Of High Frequency Scanning Acoustic Microscopy**
Jan Pfeiffer, Patrick Müller, Philipp Schindler
PVA Löt- und Werkstofftechnik GmbH, Germany

O-18 **Study of the Interfacial Temperature Development for Various Friction Welding Processes**

Alexander Bikmeyev[1], Achilles Vairis[2], Wenya Li[3]
[1]Ufa State Petroleum Technical University, Russia, [2]Hellenic Mediterranean University, Greece, [3]Northwestern Polytechnical University, China

16:30-18:00 **[Future Technology] Fe-Al Dissimilar Joint** **Akatsuki (29F)**

Chair: Yosuke Ogino, Osaka University

F-28 **Development of High-speed Brazing Technology Combining Hot-wire and High-power Diode Laser for Steel/Aluminum Alloy Dissimilar Joint (1st Report) - Study of Influential Factors on Strength of Flare-V Groove Joint Brazed by High-speed Brazing Process -**

T. Ito [1], K. Tomita[2], K. Taniguchi[2], S. Igi[2], J. Choi[1], M. Yamamoto[1]
[1]Graduate School of Advanced Science and Engineering, Hiroshima University, Japan, [2] Steel Research Laboratory, JFE Steel Corporation, Japan

F-29 **Development of High-speed Brazing Technology Combining Hot-wire and High-power Diode Laser for Steel/Aluminium Alloy Dissimilar Joint (2nd Report) - Evaluation of the Effect of Coating on Microstructural Evolution during High-speed Brazing Process -**

Kai Tomita[1], Tamaki Ito[2], Koichi Taniguchi[1], Satoshi Igi[1], Jeongwon Choi[2], Motomichi Yamamoto[2]
[1]JFE Steel Corporation, Japan, [2]Hiroshima University, Japan

11:00-18:00 **Poster Session** **Foyer (B1F)**

PA-1 **Thermal-mechanical Coupling Analysis for CDFW of U75V Rail Steel by Numerical Simulation and Experimental Validation**

Han Zhang[1,2], Zhiming Zhu[1,2]
[1]Department of Mechanical Engineering, Tsinghua University, China, [2]Key Laboratory for Advanced Materials Processing Technology, Ministry of Education of China, Tsinghua University, China

PA-2 **Nanoparticles Joining Mechanisms in Stereolithographic Additive Manufacturing**

Soshu Kirihara, Fiona Spirrett
Joining and Welding Research Institute, Osaka University, Japan

PA-3 **Mechanical Property Analysis of High Hardness Die Steel using Flux Cored-Wire Arc Manufacturing (FC-WAAM)**

Chang Jong Kim, Seok Kim, Young Tae Cho
Changwon National University, South Korea

PA-4 **[Cancelled] Mechanical Strength Characterization of Additively Manufactured Composites via Rotational Toolpath in FDM 3D Printing**

PA-5 **Additive Manufacturing of Gas Turbine Blades Through Arc Heat Source Prediction and Control**

Gwang Ho Jeong[1], Seok Kim[1,2], Young Tae Cho[1,2]
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PA-6 **Structural Analysis of AISI 316LSi Multilayer Joint Made by Wire Arc Additive Manufacturing**
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PA-7 **Proposal of New Weibull Stress Equation Based on The Damage Assessment for Steel Structures Subjected to Cyclic Pre-Strain**
Rafael Magalhães de Melo Freire[1], Naoya Oie[1], Tomoya Kawabata[1], Shunsuke Takagi[2]
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PA-8 **Effect of Offset Value of Microstructure and Properties of Aluminum/Steel Fluxless Cutting-assisted Welding Brazing Joint**
Huibin Xu, Pan Tan, Bangjin Li, Donghua Yang
Chongqing University of Technology, China

PA-9 **Hardness Distribution Prediction of High Strength Steel Spot Welds**
Tadashi Kasuya[1], Takaaki Kondo[2], Kei Saito[2], Junya Inoue[1], Manabu Enoki[1]
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PA-10 **Influence of Oxygen Partial Pressure on Surface Tension of Liquid Titanium**
Yusaku Seimiya[1], Ryo Shinazawa[1], Tomohiro Katsumi[1], Yu Kudo[1], Takehiko Ishikawa[2,3], Shumpei Ozawa[1]
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PA-11 **Interface Microstructure Evolution of Dissimilar Aluminium and Medium Carbon Steel Friction Stir Welded Joints using Zn Interlayers**
Mohamed Saleh, Yoshiaki Morisada, Kohsaku Ushioda, Hidetoshi Fujii
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PA-12 **Metals as Carbon Dioxide Atmosphere Fuel Materials**
Wataru Takahara, Akio Hirose
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PA-13 **Intermetallic Compound Formation on Al/Fe Interface Produced by Surface Activated Bonding**
Shun Tokita[1], Ryo Nagase[1], Yutaka S. Sato[1], Kazuhiro Ogawa[2], Yuji Ichikawa[2]
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PA-14 **Microscale Tensile Testing to Identify Dominant Factors for Macroscopic Fracture Strength of Friction Stir Spot Welded Joints between 6061 Aluminum Alloy and Steel**
Tomoki Matsuda, Toshiya Ogaki, Mitsuru Ohata, Akio Hirose
Osaka University, Japan

PA-15 **Loading Mode Effect on Brittle Fracture Toughness under Large-scale Yielding**
Kazuma Shimizu, Mitsuru Ohata, Hiroto Shoji
Osaka University, Japan

PA-16 **Dissimilar Welding of New High Oxidation Material - THOR 115 with Grade 92**
Michał Urzynicok[1], Krzysztof Kwieciński[2], Hanna Purzyńska[3], Marek St. Węglowski[2]
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PB-1 **Flaw Detection and Evaluation in Friction Stir Welded Joints of Aluminium Alloy AA5083 by High Resolution Computed Radiography and Microcomputer Tomography**
Luis C. Fabrício Filho[1], Armando H. Shinohara[1], Thigo S. Coutinho[2], Gustavo D. Donatelli[2]
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PB-2 **Data Science Techniques to Extract Information from Image Data**
Hiromichi Nagao[1,2], Shin-ichi Ito[1,2], Ryosuke Kaneko[1,2]
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PB-3 **Integrated Framework of Microstructure-Based Simulation for Fatigue Life Prediction of Welded Joints**
Takayuki Shiraiwa, Fabien Briffod, Manabu Enoki
The University of Tokyo, Japan

PB-4 **Evaluation of Bending Specimens in Standard Qualification Test for Welding Technique using Deep Learning**
Tetsuya Uedera[1], Taiga Motoki[2], Keigo Matsuura[1], Kenji Shinozaki[3]
[1]National Institute of Technology Kure College, Japan, [2]Hiroshima University Graduate School, Japan, [3]Professor Emeritus Hiroshima University, Japan

PB-5 **A Study on the Selection of Seam Tracking Signals in Tandem Welding**
Bo Wook Seo[1], Seok Kim[1,2], Young Tae Cho[1,2]
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PB-6 **[Cancelled] Durability of anticorrosive coated steel-CFRP structural adhesive joint under high temperature and high humidity**

PB-7 **Behavior of Hydrogen in Duplex Stainless Steel Weld Metal Investigated by Means of Hydrogen Microprint Technique**
Toya Hada[1], Toshiaki Manaka[1], Takanori Hino[1], Masaki Uno[2]
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PB-8 **Effect of Laser Peening with Portable Laser Peening Device on the Fatigue Properties of HT780 Butt-welded Joints**
Tomoharu Kato[1], Yoshihiro Sakino[1], Yuji Sano[2,3,4], Yoshio Mizuta[3], Satoshi Tamaki[4], Tomonao Hosokai[3]
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PB-9 **Development of Cold Spot Joining (Solid State Resistance Spot Joining) Method for Various Steels**
Hidetoshi Fujii[1], Takumi Aibara[1], Masayoshi Kamai[1], Yoshiaki Morisada[1], Takaaki Miyauchi[2], Shinichi Hasegawa[2]
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PB-10 **Study on Mechanical Properties of Advanced Multi-Material Dissimilar Lap Joints**
Hisashi Serizawa
Osaka University, Japan

PB-11 **Hairpin Welding of Pure Copper Wire using Hybrid Laser System with Blue Diode Laser and Single-mode Fiber Laser**
Shumpei Fujio[1], Yuji Sato[2], Keisuke Takenaka[2], Rika Ito[2], Masahiro Tsukamoto[2]
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PB-12 **[Cancelled] Pulsed Laser-Arc Hybrid Welding: High Speed Camera Investigation Of The Power Sources Synchronization Effects**

PB-13 **Experimental Study of Dominant Factors for Droplet Ejection from Tungsten Electrode during AC TIG Welding**
Kenta Iida[1], Hisaya Komen[1], Masaya Shigeta[2], Manabu Tanaka[1]
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PB-14 **Effect of Rapid Cooling on Residual Stress and Fatigue Strength**
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PB-15 **Simulation of Heat Source Characteristics during Arc Spot Welding with Constricted Nozzle**
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PB-16 **Numerical Investigation of Influencing Factors of Slag Transportation Process during Metal Active Gas Welding using Incompressible Smoothed Particle Hydrodynamics Method**
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