ISSN 0387-4508

TRANSACTIONS

OF

J W R I

Vol. 51

2022

JOINING AND WELDING RESEARCH INSTITUTE

OSAKA UNVERSITY

JAPAN

Organization and Staff (December 2022)

Director	Dr. TANAKA Manabu

1. Research Division of Materials Joining Process

1) Energy Control of Processing

Professor	Dr. TANAKA Manabu
Associate Professor	Dr. KOMEN Hisaya
Assistant Professor	Dr. TASHIRO Shinichi
Specially Appointed Associate Professor	Dr. LI Fang
Guest Professor	Dr. NAKATA Kazuhiro
Guest Professor	Dr. MITA Tsuneo
Guest Professor	Dr. NISHIYAMA Hideya
Guest Professor	Dr. HOSOI Koichi
Guest Academic Staff	Dr. XU Bin
Guest Researcher	Dr. FUJIYAMA Shoji

2) Energy Transfer Dynamics

Professor	Dr. SETSUHARA Yuichi
Associate Professor	Dr. TAKENAKA Kosuke
Assistant Professor	Dr. TOKO Susumu
Guest Professor	Dr. ONO Kouichi
Guest Professor	Dr. UCHIDA Giichiro

3) Micro Joining

Professor	Dr. NISHIKAWA Hiroshi
Associate Professor	Dr. TATSUMI Hiroaki
Guest Professor	Dr. TAKAHASHI Yasuo
Guest Professor	Dr. CHAN Yon Cheong
Guest Academic Staff	Dr. ZHANG Ning
Specially Appointed Researcher	Dr. NAOE Takuya
Specially Appointed Researcher	Dr. JIN Zhi
Specially Appointed Researcher	Dr. WANG Jianhao
Guest Researcher	Dr. PU Juan
Guest Researcher	Dr. HAN Jiang

4) Laser Materials Processing

Professor	Dr. TSUKAMOTO Masahiro
Associate Professor	Dr. SATO Yuji
Guest Professor	Dr. KIKUCHI Yasushi
Specially Appointed Researcher	Mr. TAKENAKA Keisuke
Specially Appointed Researcher	Ms. HIGASHINO Ritsuko
Specially Appointed Researcher	Mr. YOSHIDA Norio
Specially Appointed Researcher	Mr. TOKUMOTO Jumpei

5) Advanced Engineering Science

Guest Professor	Dr. KATO Hidemi

2. Research Division of Materials Joining Mechanism

1) Welding Mechanism

Professor	Dr. ITO Kazuhiro
Associate Professor *	Dr. TAKAHASHI Makoto
Assistant Professor	Dr. YAMAMOTO Hajime
Assistant Professor	Dr. HONG Seong Min
Specially Appointed Associate Professor	Dr. ZHAO Bingbing
Guest Professor	Dr. OGAWA Kazuhiro

2) Joint Interface Structure and Formation Mechanism

Professor	Dr. FUJII Hidetoshi
Assistant Professor	Dr. YAMASHITA Takayuki
Assistant Professor	Dr. MIURA Takuya
Specially Appointed Professor	Dr. USHIODA Kohsaku
Specially Appointed Associate Professor	Dr. MORISADA Yoshiaki
Specially Appointed Associate Professor	Dr. CHEN Juan
Specially Appointed Associate Professor	Dr. AOKI Yasuhiro
Specially Appointed Assistant Professor	Dr. SHARMA Abhishek
Guest Professor	Dr. NAGIRA Tomoya
Guest Professor	Mr. KAWAI Teruaki
Guest Academic Staff	Mr. KAGIYA Kei
Specially Appointed Researcher	Dr. SHOTRI Rishabh
Specially Appointed Researcher	Mr. KAMAI Masayoshi
Specially Appointed Researcher	Mr. KAWAKUBO Takumi
Specially Appointed Researcher	Mr. AIBARA Takumi
Specially Appointed Researcher	Ms. WU Zexi
Specially Appointed Researcher	Mr. ITO Tetsuro

3) Composite Materials Processing

Professor	Dr. KONDOH Katsuyoshi
Professor	Dr. UMEDA Junko
Assistant Professor	Dr. KARIYA Shota
Specially Appointed Assistant Professor	Dr. ISSARIYAPAT Ammarueda
Specially Appointed Assistant Professor	Dr. BAHADOR Abdollah
Guest Professor	Dr. MA Qian
Guest Professor	Dr. MIURA Hideshi
Guest Professor	Dr. YANG Yafeng
Guest Professor	Dr. LI Shufeng
Specially Appointed Researcher	Mr. HORIE Mitsuo
Specially Appointed Researcher	Ms. FUJII Hiroko
Specially Appointed Researcher	Mr. MINAMITANI Ryoji
Specially Appointed Researcher	Mr. PETERSON Jack Edward

3. Research Division of Materials Joining Assessment

1) Joining Mechanics and Analyses

Professor	Dr. MA Ninshu
Associate Professor	Dr. SERIZAWA Hisashi
Assistant Professor	Dr. GENG Peihao
Specially Appointed Assistant Professor	Dr. WANG Qian
Specially Appointed Researcher	Mr. NARASAKI Kunio
Guest Professor	Dr. LU Fenggui
Guest Researcher	Dr. WU Dongsheng

2) Joining Design and Structuring

Professor	Dr. MIKAMI Yoshiki

3) Joining Metallurgical Evaluation

Professor	Dr. IKEDA Rinsei
Associate Professor	Dr. KADOI Kota
Assistant Professor	Dr. HOU Yuyang
Guest Researcher	Dr. SINGH Handa Sukhdeep

4. Research Center for Additive Joining Application

Center Director, Professor	Dr. FUJII Hidetoshi

1) Green Additive Manufacturing

Associate Professor	Dr. ABE Hiroya
Specially Appointed Researcher	Dr. LI Fei

2) Lithographic Additive Manufacturing

Professor	Dr. KIRIHARA Soshu
Assistant Professor	Dr. SPIRRETT Fiona

3) Additive Manufacturing Mechanism

Professor	Dr. KONDOH Katsuyoshi
Professor	Dr. UMEDA Junko
Assistant Professor	Dr. KARIYA Shota

4)Laser Additive Manufacturing

Professor	Dr. TSUKAMOTO Masahiro
Associate Professor	Dr. SATO Yuji

5)Advanced Additive Manufacturing

Professor	Dr. NAITO Makio
Assistant Professor	Dr. KOZAWA Takahiro
Guest Associate Professor	Dr. KAMITANI Masataka
Specially Appointed Researcher	Dr. KONDO Akira

5. Joint Interface Microstructure Characterization Room

Associate Professor	Dr. TAKAHASHI Makoto

6.Global D&I Promotion Office

Professor *	Dr. UMEDA Junko
Associate Professor	Ms. KATSUMATA Mihoko
Assistant Professor *	Dr. HONG Seong Min
Assistant Professor *	Dr. GENG Peihao
Assistant Professor *	Dr. SPIRRETT Fiona
Technical Staff *	Ms. UEHARA Kunika

7. JFE Welding Research Alliance Laboratories

Director, Professor *	Dr. TANAKA Manabu
Vice Director, Guest Professor	Dr. TAGAWA Tetsuya
Professor *	Dr. FUJII Hidetoshi
Professor *	Dr. ITO Kazuhiro
Professor *	Dr. TSUKAMOTO Masahiro
Professor *	Dr. MIKAMI Yoshiki
Associate Professor *	Dr. KADOI Kota
Associate Professor *	Dr. SATO Yuji

8. DAIHEN Welding and Joining Research Alliance Laboratories

Director, Professor *	Dr. FUJII Hidetoshi
Vice Director, Professor *	Dr. TANAKA Manabu
Vice Director, Guest Professor	Dr. ERA Tetsuo
Specially Appointed Professor	Dr. ASAI Satoru
Specially Appointed Assistant Professor	Dr. MATSUDA Natsume
Guest Associate Professor	Dr. KADOTA Keiji
Professor *	Dr. ITO Kazuhiro
Professor *	Dr. TSUKAMOTO Masahiro
Professor *	Dr. SETSUHARA Yuichi

9. Nippon Steel Future Manufacturing Research Alliance Laboratories

Director, Professor *	Dr. FUJII Hidetoshi
Vice Director, Guest Professor	Dr. FUJIMOTO Hiroki
Guest Professor	Dr. INOUE Hiroshige
Guest Researcher	Mr. OKADA Toru
Guest Researcher	Ms. JOTOKU Kana
Guest Researcher	Mr. WATANABE Koutarou
Guest Researcher	Mr. MATSUI Sho
Guest Researcher	Mr. NOMOTO Masashi
Professor *	Dr. TANAKA Manabu
Professor *	Dr. ITO Kazuhiro
Professor *	Dr. MIKAMI Yoshiki
Associate Professor *	Dr. KADOI Kota
Professor *	Dr. SAIDA Kazuyoshi
Professor *	Dr. HIRATA Hiroyuki
Professor *	Dr. MORI Hiroaki
Professor *	Dr. OGURA Tomo
Assistant Professor *	Dr. YAMASHITA Shotaro

10. Osaka Fuji "Advanced Functional Processing" Joint Research Chair

Specially Appointed Professor	Dr. ABE Nobuyuki
Specially Appointed Assistant Professor	Mr. HAYASHI Yoshihiko
Specially Appointed Assistant Professor	Mr. MIZUTANI Masami
Specially Appointed Researcher	Mr. IKEDA Keiichirou
Guest Researcher	Mr. AZUMI Kazuyuki
Guest Researcher	Mr. TATSUMI Yoshihiro
Professor *	Dr. TSUKAMOTO Masahiro
Associate Professor *	Dr. SATO Yuji

11. Advanced Joint Production System Joint Research Chair

Specially Appointed Professor	Mr. MUKUDA Muneaki
Guest Researcher	Mr. AMASAKI Tetsuya
Guest Researcher	Mr. HARADA Naohiko
Guest Researcher	Mr. MURASE Keisuke
Professor *	Dr. FUJII Hidetoshi
Specially Appointed Associate Professor *	Dr. MORISADA Yoshiaki

12. Design & Engineering by Joint Inverse Innovation for Materials Architecture
— DEJI²MA Project —

Leader, Professor *	Dr. SETSUHARA Yuichi
Specially Appointed Professor	Dr. OHARA Satoshi

13. Global Collaborative Research Center for Computational Welding Science (CCWS)

Leader, Professor *	Dr. MA Ninshu
Guest Professor	Dr. MURAKAWA Hidekazu
Guest Professor	Dr. HIRAOKA Kazuo
Guest Professor	Dr. LI ChangJiu
Guest Professor	Dr. YASUKI Tsuyoshi
Guest Professor	Dr. NAKAO Kazunari
Guest Professor	Dr. FUJIKUBO Masahiko
Guest Associate Professor	Dr. SHIBAHARA Masakazu
Associate Professor *	Dr. SERIZAWA Hisashi

14. Joining Technology Hub

Leader, Professor *	Dr. FUJII Hidetoshi
Professor *	Dr. TANAKA Manabu
Professor *	Dr. ITO Kazuhiro
Associate Professor *	Dr. SERIZAWA Hisashi
Assistant Professor *	Dr. YAMASHITA Takayuki
Specially Appointed Professor	Dr. USHIODA Kosaku
Specially Appointed Associate Professor *	Dr. MORISADA Yoshiaki
Specially Appointed Associate Professor *	Dr. AOKI Yasuhiro
Specially Appointed Researcher *	Dr. SHARMA Abhishek
Guest Academic Staff *	Mr. KAGIYA Kei
Researcher	Mr. OGURA Takuya
Graduate School of Engineering, Professor *	Dr. HIROSE Akio
Graduate School of Engineering, Professor *	Dr. SAIDA Kazuyoshi
Graduate School of Engineering, Professor *	Dr. OHATA Mitsuru
Graduate School of Engineering, Professor *	Dr. SANO Tomokazu
Graduate School of Engineering, Associate Professor *	Dr. OGURA Tomo
Graduate School of Engineering, Associate Professor *	Dr. OGINO Yosuke
Graduate School of Engineering, Associate Professor *	Dr. NOMURA Kazufumi
Graduate School of Engineering, Assistant Professor *	Dr. MATSUDA Tomoki

15. Co-Creation Consortium for Joining and Welding with Blue Diode Laser

Professor *	Dr. TSUKAMOTO Masahiro
Associate Professor *	Dr. SATO Yuji
Specially Appointed Professor *	Dr. ABE Nobuyuki
Specially Appointed Researcher *	Mr. TAKENAKA Keisuke
Specially Appointed Researcher *	Ms. HIGASHINO Ritsuko

16. Industry Cooperation Office

Professor *	Dr. SETSUHARA Yuichi
Specially Appointed Professor	Dr. SUGA Tetsuo

***** Supplementary Assignment

Transactions of JWRI, Vol.51, 2022

CONTENTS

Research Division of Materials Joining Process, Dep. of Energy Control of Processing

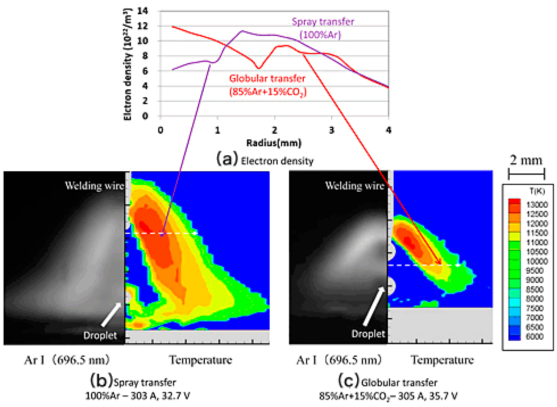
Research summary

The main research subject is the development of the high density energy source for processing advanced materials having special functions and properties. We undertake fundamental investigations of the properties of the high energy source interacting with materials, and we study advanced control techniques for optimizing the energy transport.

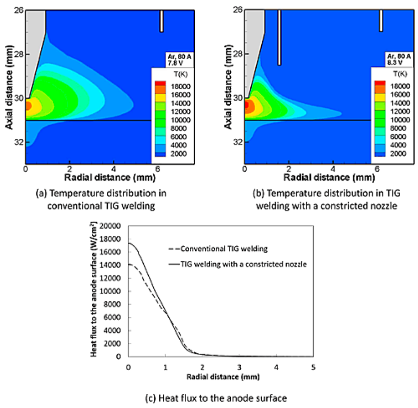
Major emphasis is placed on the generation, control and energy transport in arc plasmas, which are a high density energy source which have been applied to a variety of materials processing techniques such as welding, cutting, heating, high temperature processing, surface modification and the creation of powders.

Research subjects

(1) Generation and control of thermal plasmas, and their application to welding and joining processes
(2) Arc physics, molten pool behavior, and transport theory in fusion welding
(3) Development of new arc electrodes based on the analysis of electrode-plasma interaction
(4) Development of advanced high quality clean welding processes
(5) Development of new generation welding and joining processes employing atmospheric pressure plasma
(6) Control of arc discharge in lighting and electrical devices



Optical measurement of electron density and plasma temperature during spray transfer and globular transfer in gas metal arc welding process ((a) Electron density, (b) Spray transfer, (c) Globular transfer). An addition of CO_2 into shielding gas causes constriction of arc current toward the arc axis, which leads to globular transfer due to increase in arc pressure.



Numerical simulation on effects of constricted nozzle on arc phenomena in TIG welding process ((a) Temperature distribution in conventional TIG welding, (b) Temperature distribution in TIG welding with a constricted nozzle, (c) Heat flux to the anode surface). In TIG welding with a constricted nozzle, arc temperature increases due to constriction of arc. Consequently, larger heat flux to the anode surface is obtained compared with that of conventional TIG welding.

Major Papers

A. Kapil, T. Suga, M. Tanaka, A. Sharma, "Towards hybrid laser-arc based directed energy deposition: Understanding bead formation through mathematical modeling for additive manufacturing", J. Manuf. Process., (2022), 76, 457-474.
doi

K. Ishida, S. Tashiro, K. Nomura, D. Wu, M. Tanaka, "Elucidation of arc coupling mechanism in plasma-MIG hybrid welding process through spectroscopic measurement of 3D distributions of plasma temperature and iron vapor concentration", J. Manuf. Process., (2022), 77, 743-753.
doi

S. Tashiro, S. Bin Mamat, A. B. Murphy, T. Yuji, M. Tanaka, "Numerical Analysis of Metal Transfer Process in Plasma MIG Welding", metals, (2022), 12, 326.
doi

N. Q. Trinh, S. Tashiro, T. Suga, T. Kakizaki, K. Yamazaki, A. Lersvanichkool, H. V. Bui and M. Tanaka, "Metal Transfer Behavior of Metal-Cored Arc Welding in Pure Argon Shielding Gas", metals, 12 (2022), 1577.
doi

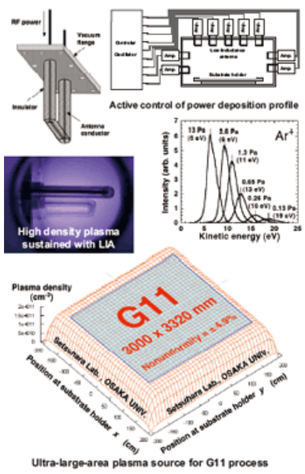
Research Division of Materials Joining Process, Dep. of Energy Transfer Dynamics

Research summary

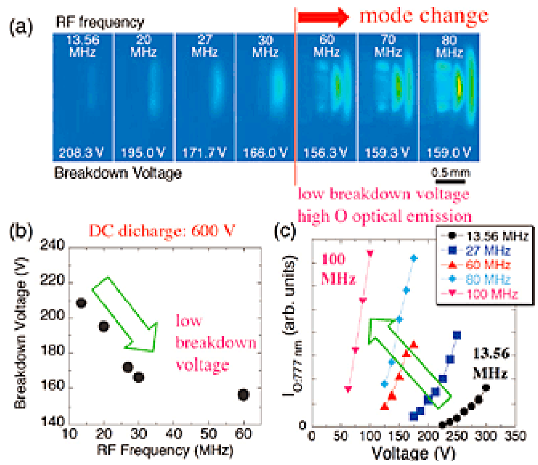
Our research activities encompass works on development of process control technologies of surface and interface for advancement of materials joining science and processing technologies through creation of novel process-energy sources (plasmas and particle beams), and span the range of applications from to functionalization of materials to their process control. These research activities are based on fundamental studies on energy transfer dynamics involved in a variety of materials processing with process-energy sources.

Research subjects

(1) Development of novel plasma sources and particle beams for advanced process technologies (CVD, PVD)
(2) Development of novel large-area, low-damage and high-density plasma sources for advanced process control of functional materials
(3) Development of novel large-area, low-damage and high-density plasma sources for advanced process control of functional materials
(4) Creation of softmaterial processing science for development of advanced green nanotechnologies with inorganic/organic flexible hybrid structures
(5) Studies on temporal and spatial control of discharge for development of innovative plasma sources for plasma medicine



Low-damage and ultra-large-area plasma source with multiple low inductance antenna modules



Development of innovative plasma source for plasma medicine
(a) ICCD images of atmospheric RF plasmas
(b) Frequency dependence of discharge breakdown voltage
(c) Frequency dependence of O optical emission intensity

Major Papers

K. Takenaka, R. Machida, T. Bono, A. Jinda, S. Toko, G. Uchida , Y. Setsuhara, “Development of a non-thermal atmospheric pressure plasma-assisted technology for the direct joining of metals with dissimilar materials”, J. Manuf. Process., 75 (2022), 664-669.
doi

S. Toko, M. Ideguchi, T. Haseagawa, T. Okumura, K. Kamataki, K. Takenaka, K. Koga, M. Shiratani, Y. Setsuhara, “Effect of gas flow rate and discharge volume on CO_2 methanation with plasma catalysis”, Jpn. J. Appl. Phys., 64 (2022), SI1002.
doi

S. Nunomura, K. Kamataki, T. Nagai, T. Misawa, S. Kawai, K. Takenaka, G. Uchida, K. Koga, “Plasma Synthesis of Silicon Nanoparticles: From Molecules to Clusters and Nanoparticle Growth”, IEEE Open J. Nanotechnol., 3 (2022), 94-100.
doi

G. Uchida, K. Nagai, Y. Habu, J. Hayashi, Y. Ikebe, M. Hiramatsu, R. Narishige, N. Itagaki, M. Shiratani, Y. Setsuhara “Nanostructured Ge and GeSn films by high-pressure He plasma sputtering for high-capacity Li ion battery anodes” Sci Rep, 12(2022), 1742.
doi

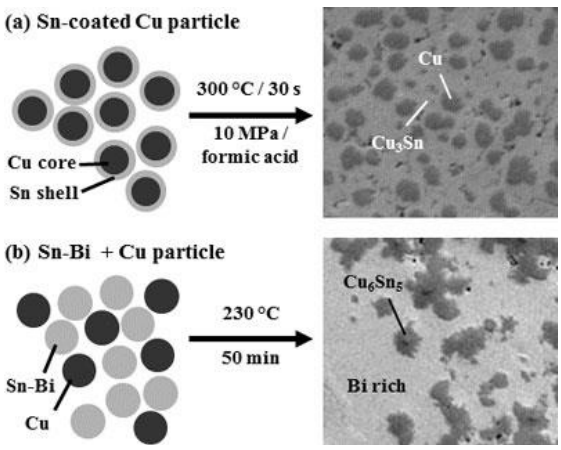
Research Division of Materials Joining Process, Dep. of Micro Joining

Research summary

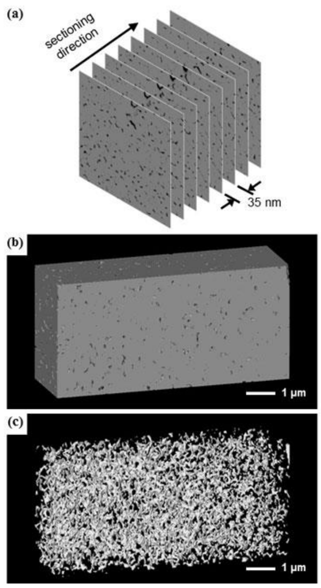
The main research objectives are for electronics packaging to develop advanced joint materials, to establish advanced micro joining processes, and to elucidate the mechanisms of the micro joining processes. Especially, the creation of the functional joint materials, the development of novel advanced micro processes by various energy sources, the understanding of interfacial behaviors in nano-/micro-scale, and the enhancement of the highly reliable joints based on the control of interfacial structure and performance are performed.

Research subjects

(1) Development and evaluation of advanced micro joining process
(2) Elucidation of micro joining phenomena and defect suppression
(3) Control and analysis of microstructure at soldered interface
(4) Development of eco-friendly fluxless soldering process using a reducing atmosphere
(5) Formation of high heat-resistance joint using three-dimensional nanostructure
(6) Simulation-based evaluation of micro joints nanostructure



Micro joining process using a transient liquid phase bonding (TLPB) method
(a)TLPB process and microstructure of joint using Sn-coated Cu particles
(b)TLPB process and microstructure of joint using Sn-Bi solder particles + Cu particles



Microstructure of sintered joint using Ag nanoparticle paste
(a)Serial sectioning of Ag sintered layer by FIB/SEM system
(b)Reconstructed 3D image of Ag sintered layer
(c)Reconstructed 3D pore distribution into Ag sintered layer

Major Papers

H. Tatsumi, H. Nishikawa, "Anisotropic highly conductive joints utilizing Cu-solder microcomposite structure for high-temperature electronics packaging", Mater. Des., 223 (2022), 111204.
doi

H. Tatsumi, S. Kaneshita, Y. Kida, Y. Sato, M. Tsukamoto, H. Nishikawa, "I Highly efficient soldering of Sn-Ag-Cu solder joints using blue laser", J. Manuf. Process., 82 (2022), 700-707.
doi

H. Tatsumi, C. R. Kao & H. Nishikawa, "Solid-state bonding behavior between surface-nanostructured Cu and Au: a molecular dynamics simulation", Sci. Rep., 12 (2022), 12755.
doi

J. Wang, X. Liu, F. Huo, K. Kariya, N. Masago, H. Nishikawa, "Novel transient liquid phase bonding method using In-coated Cu sheet for high-temperature die attach", Mater. Res. Bull., 149 (2022), 111713.
doi

B. Park, M. Saito, J. Mizuno, H. Nishikawa, "Robust shear strength of Cu–Au joint on Au surface-finished Cu disks by solid-state nanoporous Cu bonding", Microelectron. Eng., 260 (2022), 111807.
doi

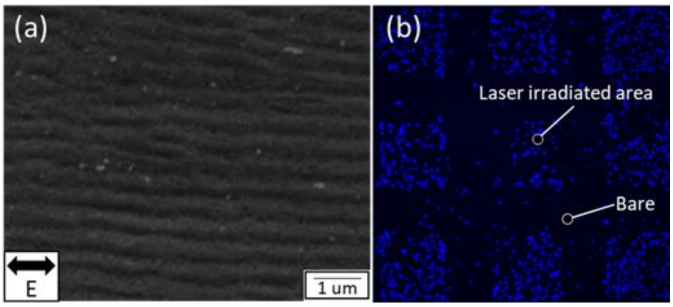
Research Division of Materials Joining Process, Dep. of Laser Materials Processing

Research summary

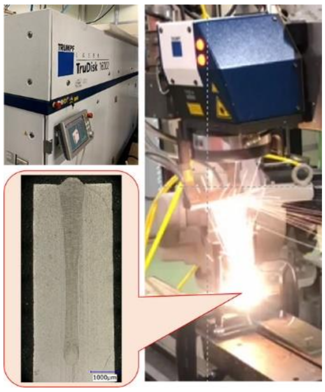
Fundamental studies are performed concerning welding, joining, cutting, surface modification and removal processing with laser beams, aimed at advanced fusion between laser science and production engineering. We focus on clarification of welding or joining mechanisms on the basis of the visualization of material processing phenomena with high-speed optical observation or X-ray transmission imaging techniques. Moreover, laser should be utilized with not only high thermal efficiency but also physicochemical effects induced by interaction between light and material. Thus we create innovative processes including laser direct joining of metal and plastic, put these processes to practical use and disseminate achievements of our research to the world.

Research subjects

(1) Development and evaluation of joining and welding processes for the advanced functional materials
(2) Development of additive manufacturing technologies with blue diode laser
(3) Creation of new function by surface modification with laser
(4) Fundamental studies on laser interaction with materials and fundamental studies of materials processing utilizing laser



PMMA film surface after femtosecond laser irradiation.
(a) SEM image with periodic nanostructures oriented to the direction perpendicular to the laser polarization vector (The period of the periodic nanostructure is about 230nm) on PMMA film surface.
(b) Fluorescence microscope image of cell cultivation test. Cells adhered to the periodic nanostructures surface rather than bare surface.



Clarification of laser welding phenomena with 16 kW disk laser

Major Papers

K. Takenaka, Y. Sato, S. Fujio, K. Nishida, R. Ito, E. Hori, S. Kato, M. Suwa, S. Uno, K. Tojo and M. Tsukamoto, “Bead-on-plate welding of pure copper with a 1.5-kW high-power blue diode laser”, Weld. World, 67 (2022), 99-107.
doi

K. Maeda, Y. Sato, K. Takenaka, S. Fujio, R. Suzuki, T. Suga and M. Tsukamoto, “Behavior of melt flow and porosity formation in laser welding of steel to aluminum with cold-sprayed steel interlayer”, J. Laser Appl., 34 (2022), 042033.
doi

T. Arita, Y. Sato, Y. Kurita, M. Mizutani, H. Nakano and M. Tsukamoto, “In situ observation of dynamics of keyhole and molten pool in laser welding for development of spatter suppression”, J. Laser Appl., 34 (2022), 032017.
doi

K. Takenaka, Y. Sato, M. Tsukamoto, “Effect of polymer permittivity on periods of LIPSS formed on titanium with femtosecond laser pulses”, Appl. Phys. A-Mater. Sci. Process., 128 (2022), 881.
doi

S. Fujio, K. Takenaka, Y. Sato, R. Ito, E. Hori and M. Tsukamoto, “Effect of blue diode laser intensity on welding of pure copper wire using blue-IR hybrid laser”, J. Laser Appl., 34(4)(2022), 042021.
doi

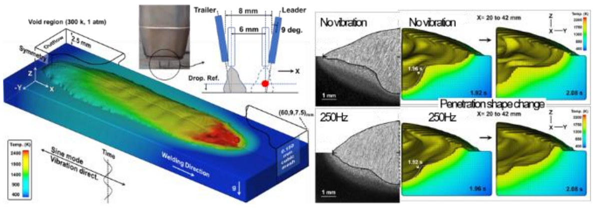
Research Division of Materials Joining Mechanism, Dep. of Welding Mechanism

Research summary

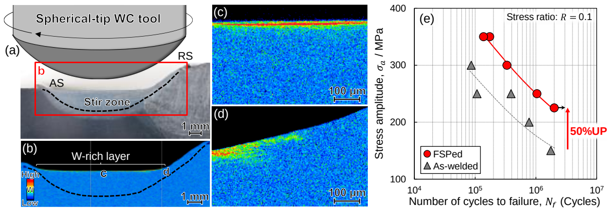
Mechanisms controlling the joint performance of structural and functional materials, which obtained by fusion welding, liquid-state/solid-state bonding, and solid-state bonding, are metallographically characterized to establish a scientific basis to produce joint materials featuring superior performance. The microstructures of the weld-deposited metal, the heat-affected zone of fusion-welded joints, and the interfacial region of solid-state bounded joint are thoroughly investigated utilizing various methods such as X-ray diffraction, electron-microscopy observation, elementary analysis, EBSP analysis, and numerical modeling and simulation. Formation processes of the microstructures and their relation to joint performance are discussed from the material scientific viewpoint.

Research subjects

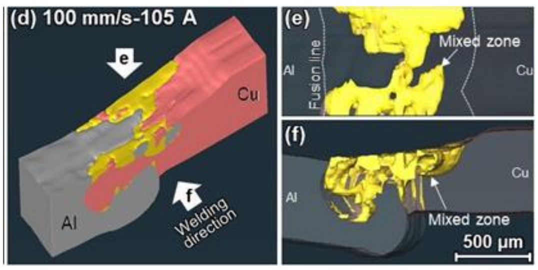
(1) Weld microstructure analyses of structural material such as steel
(2) Bonding mechanism of solid-state joining of metals and ceramics, and its application to microstructural control
(3) Application of welding and joining phenomena to development of advanced materials
(4) Synthesis of new functional materials at welding and joining interface
(5) Evaluation of the effect of microstructure on mechanical behavior of structural materials joints



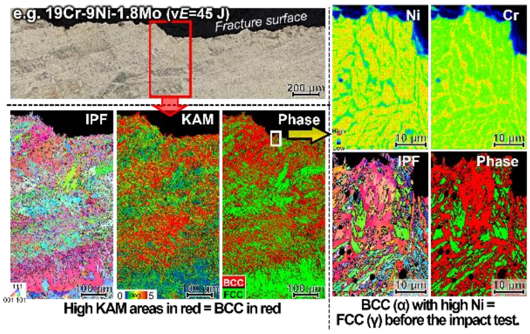
Welding-time variation of penetration shape change in the simulated vibration assisted tandem-pulsed GMAW using the Flow-3D commercial software in the presence of sine-vibration parallel to the welding direction (250 Hz) and the surface tension active elements.



Geometry modification and W-rich layer formation for weld toe of high-strength low-alloy steel joints using friction stir processing (FSP) with spherical-tip WC tool, resulting in fatigue strength improvement.



(d) 3D image of the 100 mm/s-105 A, Al/Cu joints, reconstructed by the serial sectioning technique. The volumes of Al, Cu, and Al/Cu-mixed zone are colored gray, orange, and yellow, respectively. Their (e) top-view and (f) cross-sectional 2D images with the mixed zone highlighted.



Deformation induced phase transformation from FCC to BCC occurred in an impact test of δ-ferrite-containing γ stainless steel deposited metal at liquid N2 temp., resulting in increasing ultralow-temp. toughening.

Major Papers

H. Yamamoto, S. Koga, K. Ito, Y. Mikami, “Fatigue strength improvement due to alloying steel weld toes with WC tool constituent elements through friction stir processing”, Int. J. Adv. Manuf. Technol., 119 (2022), 6203-6213.

doi

H. Yamamoto, R. Oda, K. Ito, H. Maniwa, Y. Kitagawa, H. Watanabe, “Toughening due to deformation induced martensitic transformation in delta ferrite-containing austenitic stainless steel weld metals”, IIW Annual Assembly 2022, held on July in Tokyo.

Research Division of Materials Joining Mechanism, Dep. of Joint Interface Structure and Formation Mechanism

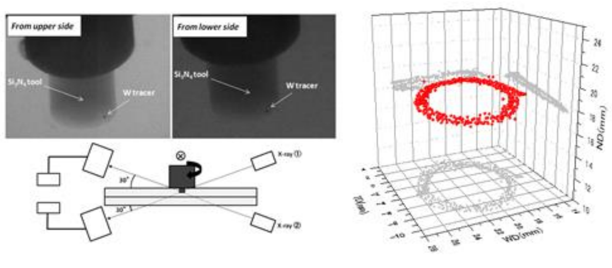
Research summary

In this department, based on the elucidation of the various phenomena at the joint interfaces of ferrous, nonferrous, non-metal materials at both macroscopic and microscopic levels, the interface formation mechanisms during various joining processes are clarified to create new interface control methods.

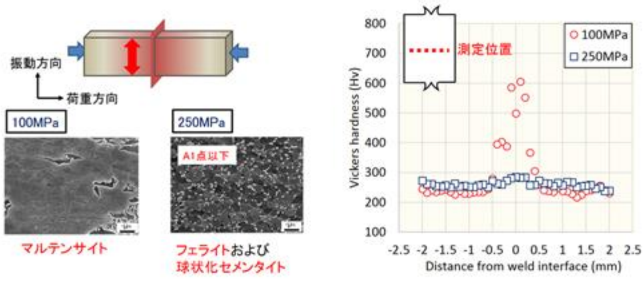
In addition, novel welding and modification processes are developed, mainly based on fusion welding methods and friction welding methods such as the friction stir welding, rotary friction welding and linear friction welding methods, which is the core of the fundamental technologies having a great potential to produce new values. These developments are going to be used and focused simultaneously in our society in order to create a new research field and elevate the continuous growth of industrial competitiveness of our country.

Research subjects

(1) Control of interface and elucidation of formation mechanism during friction welding (FSW, Friction welding, Linear friction welding)
(2) Development of novel joining and modification processes
(3) Elucidation of formation mechanism of weld interface and molten pool
(4) Analysis of joint interface structure
(5) Control of solid-liquid interface formation



Three-dimensional visualization of the material flow using a W tracer during the FSW.



SEM microstructures and Vickers hardness along the central axis of LFWed joints.

Major Papers

A. Sharma, Y. Morisada, and H. Fujii, "Bending induced mechanical exfoliation of graphene interlayers in a through thickness Al-GNP functionally graded composite fabricated via novel single-step FSP approach", Carbon, 186 (2022), 475-491.
doi

J.-W. Choi, W. Li, K. Ushioda, M. Yamamoto, and H. Fujii, "Strengthening mechanism of high-pressure linear friction welded AA7075-T6 joint", Mater. Charact., 191 (2022), 112112.
doi

X. Wang, Y. Morisada, K. Ushioda, and H. Fujii, "Double-sided friction stir spot welding of ultra-high strength C-Mn-Si martensitic steel by adjustable probes", J. Mater. Process. Technol., 300 (2022), 117422.
doi

T. Kawakubo, K. Ushioda, and H. Fujii, "Grain boundary segregation and toughness of friction-stir-welded high-phosphorus weathering steel", Mater. Sci. Eng. A, 832 (2022), 142350.
doi

M. Zhou, Z. Zeng, C. Cheng, Y. Morisada, Q. Shi, J.-Y. Wang, and H. Fujii, "Effect of the processing route on the microstructure and mechanical behavior of superlight Mg-9Li-1Zn alloy via friction stir processing", J. Magnes. Alloy., 10 (2022), 3064-3081
doi

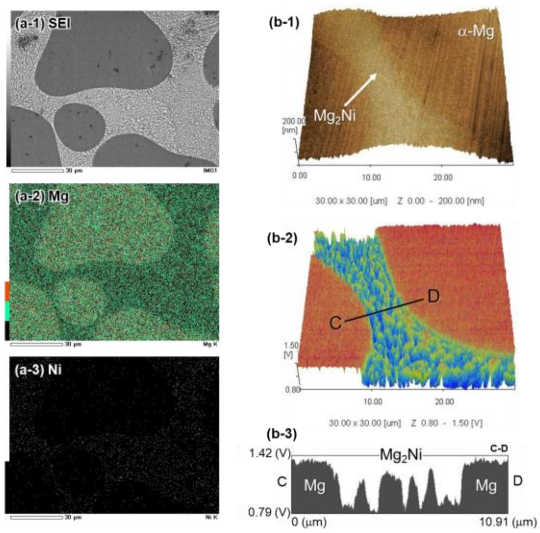
Research Division of Materials Joining Mechanism, Dep. of Composite Materials Processing

Research summary

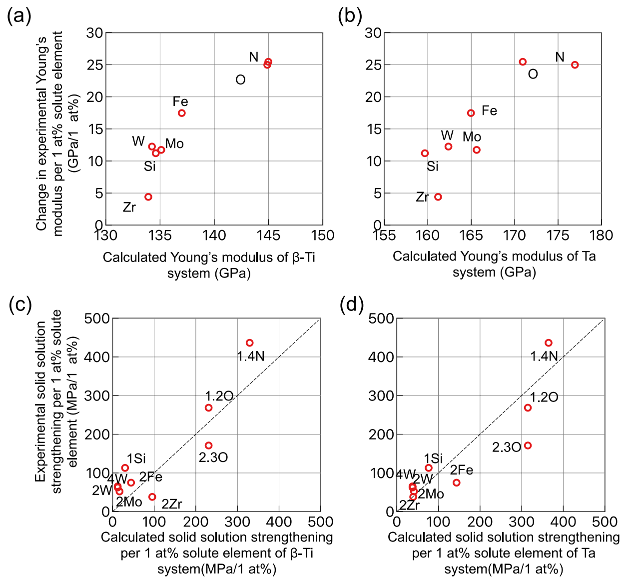
From a viewpoint of the energy saving and environmental problem solutions, the research fields of this department focus on both of the effective reuse of resources and energy including renewable ones and reduction of life hazardous materials and air pollutions. In particular, by controlling the interfacial mechanics and high-performance of materials, atomic/nano-scale composite materials and processing designs for the environmentally benign are established, and applied to innovative industrial development.

Research subjects

(1) Powder based titanium materials with static and dynamic high-strength & ductility
(2) Core-shell structured Ti-N composite powders via solid-gas reaction
(3) Laser powder bed fusion titanium alloys strengthened by solid-solution and nano-dispersoids
(4) Nano-carbon materials reinforced metal matrix composites via local interface mechanics
(5) Direct bonding of plastic materials to metals by molecular structure and fine bubbles control
(6) Local surface potential difference in CNTs reinforced metal materials and its applications



SEM-EDS (a) and AFM-SKPFM (b) analysis results of Mg-Ni cast alloy and surface potential difference between the Mg_2Ni IMCs and Mg matrix.



Comparison between experimental & calculated results. Changes in experimental Young's modulus versus calculated one of (a) β-Ti and (b) Ta systems. Solid solution strengthening by experimental & calculation of (c) β-Ti and (d) Ta systems.

Major Papers

S. Kariya, A. Issariyapat, A. Bahador, J. Umeda, J. Shen and K. Kondoh, "Ductility improvement of high-strength Ti– O material upon heteromicrostructure formation", Mater. Sci. Eng. A, 842 (2022) 143041. doi

K. Kondoh, R. Takei, S. Kariya, S. Li and J. Umeda, "Quantitative analysis on surface potentials of impurities and intermetallic compounds dispersed in Mg alloys using scanning Kelvin probe force microscopy and ultraviolet photoelectron spectroscopy", Mater. Chem. Phys., 279 (2022) 125760. doi

K. Shitara, K. Yokota, M. Yoshiya, J. Umeda and K. Kondoh, "First-principles design and experimental validation of β-Ti alloys with high solid-solution strengthening and low elasticities", Mater. Sci. Eng. A, 843 (2022) 143053. doi

A. Bahador, A. Yurtsever, A. Amrin, S. Kariya, J. Umeda, J. Shen, B. Chen, T. Fukuma and K. Kondoh, "Room temperature and high-temperature properties of extruded Ti–4Fe–3W/2TiC composites in α+ß and ß phases", Mater. Design, 220 (2022) 110901. doi

J. Wan, J. Yang, X. Zhou, B. Chen, J. Shen, K. Kondoh and J. Li, "Superior tensile properties of graphene/Al composites assisted by in-situ alumina nanoparticles", Carbon, 204 (2023) 447-455 doi

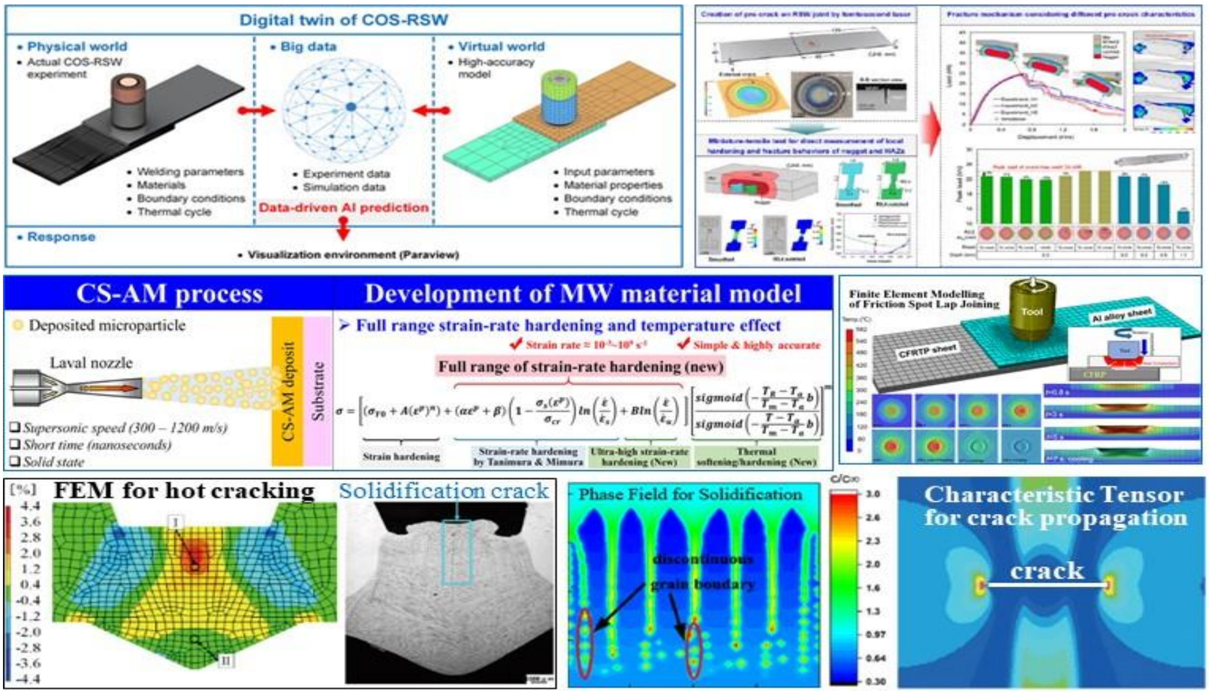
Research Division of Materials Joining Assessment, Dep. of Joining Mechanics and Analyses

Research summary

The mathematical and numerical modelling is a basis of the Artificial Intelligent (AI) and one of the most efficient approaches to look into various detail phenomena involved in joining & welding & additive manufacturing processes. In addition, assessment to residual stress/strain and strength of various types of joints between dissimilar materials is being studied through both the advanced measuring technology and numerical computational approaches.

Research subjects

(1) Computational modelling of nonlinear thermo-mechanical-metallurgical phenomena in multi-materials additive manufacturing, fusion welding and solid-state joining.
(2) Artificial Intelligent (AI) and digital twin for full manufacturing processes including metal forming, joining, welding and assembling of structures.
(3) Integration of FEM and Field Measurement (M-FEM) using DIC in various tests for identification of internal residual stress and fracture criteria of materials and various types of joints.



Major Papers

W. Huang, Q. Wang, N. Ma, H. Kitano, “Investigation of residual stress distribution pattern in typical wall and pipe components built by wire arc additive manufacturing”, J. Manuf. Proc., 82 (2022), 434-447. doi

Z. Feng, N. Ma, K. Hiraoka, Y. Komizo, S. Kano & M. Nagami, “Development of 16Cr8Ni low transformation temperature welding material for optimal characteristics under various dilutions due to all repair welding positions”, Sci. Technol. Weld. Join., Dec. 2022. doi

P. Geng, Y. Ma, N. Ma, H.Ma, Y. Aoki, H. Liu, H. Fujii, C. Chen, “Effects of rotation tool-induced heat and material flow behaviour on friction stir lapped Al/steel joint formation and resultant microstructure”, I. J. Mach. Tools., 174 (2022) 103858. doi

T. Wu, Y. Ma, H. Xia, T. Niendorf, N. Ma, “Measurement and simulation of residual stresses in laser welded CFRP/steel lap joints”, Compos. Struct., 292 (2022) 115687, 1-14. doi

Y. Ma, Y. Abe, P. Geng, R. Akita, N.Ma, K. Mori, “Adhesive dynamic behavior in the clinch-bonding process of aluminum alloy A5052-H34 and advanced high-strength steel JSC780”, J. Mat. Proc. Tech., 305 (2022) 117602. doi

Research Division of Materials Joining Assessment, Dep. of Joining Design and Structuring

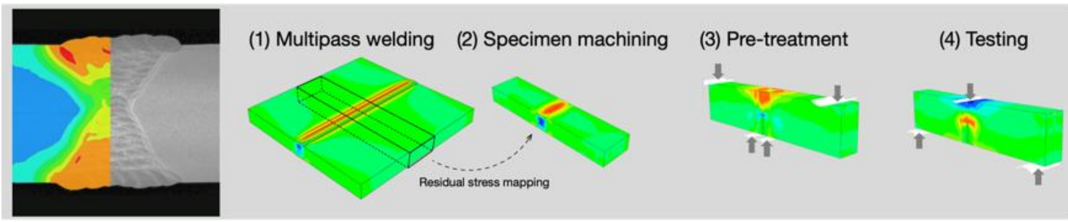
Research summary

In this research division, the structural design and fabrication processes are considered in the following two aspects: the "through-process" and "trans-scale." The concept of "through-process" considers the time axis throughout the life cycle, from the design and construction process, such as welding and joining, to testing, service, repair, reinforcement, and maintenance. The concept of "trans-scale" considers spatial axes ranging from micro to macro, such as the microstructure of materials of welds, welding and joining components, and structures.

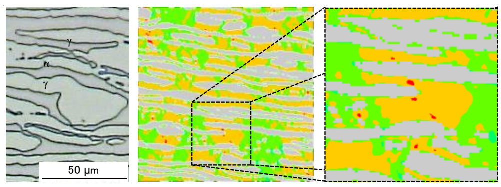
We research the evaluation of the performance and reliability of various structures at each of these stages and scales. In particular, the effects of thermal processing, represented by residual stresses and deformations, on the performance of welded and joined components and structures will be clarified from microscopic and macroscopic perspectives. We will also develop a detailed and intelligent evaluation method based on these findings. Our goal is to establish design engineering that contributes to advancing structuring processes such as welding and joining.

Research subjects

(1) Development of evaluation methods for strength properties and reliability of structural members, welds and joints
(2) Development of performance evaluation technique for welded structures in consideration of residual stress
(3) Development of manufacturing process simulation technology for design applications
(4) Development of damage evaluation method considering microscopic plastic deformation behavior of materials and welds
(5) Evaluation of cracking characteristics considering the heterogeneity of structural materials and weld



Through-process simulation of specimen machining, residual stress modification, and fracture toughness testing.



Evaluation of crack initiation characteristics of structural materials considering microstructure.

Evaluation of mechanical properties of various members by large-scale structural performance evaluation system

Major Papers

T. Ozawa, T. Kawabata, Y. Mikami, “Proposal of New MOTE Methods for Brittle Fracture Toughness Determination”, ISIJ Int., 62 (2022), 1301-1311.
doi

H. Kitano, Y. Mikami, “Constructing a heat source parameter estimation model for heat conduction finite element analysis using deep convolutional neural network”, Mater. Today Commun., 31 (2022), 103387.
doi

T. Ozawa, T. Kawabata, Y. Mikami, “Quantitative evaluation of fracture toughness deterioration due to Pre-strain”, Eng. Fract. Mech., 272 (2022), 108683.
doi

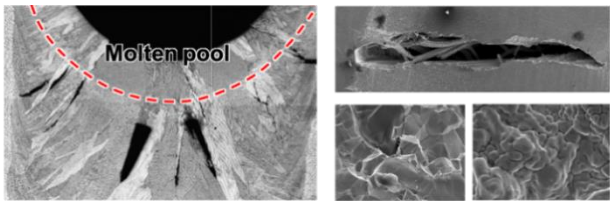
Research Division of Materials Joining Assessment, Dep. of Joining Metallurgical Evaluation

Research summary

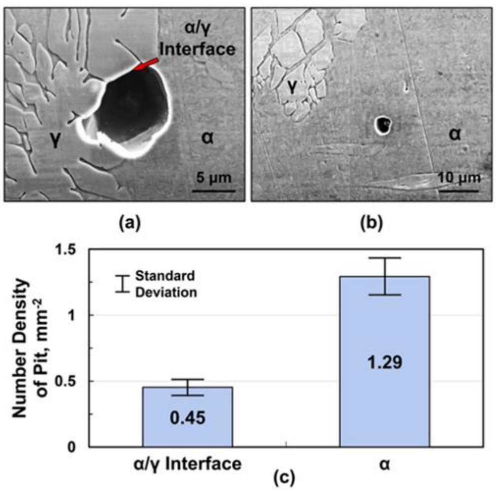
Development of innovative manufacturing technology is required to manufacture high-performance machine products and structures of the next-generation. Department of Joining Metallurgical Evaluation conducts research and education for elucidation and control of the factors on weldment properties by high accurate evaluation based on material science and engineering. In order to create innovative and attractive technique of welding & Joining as a final aim, our department are working on elucidation of metallurgical phenomenon such as solidification and transformation, and on developing the predication method for the microstructures and the properties of weldments.

Research subjects

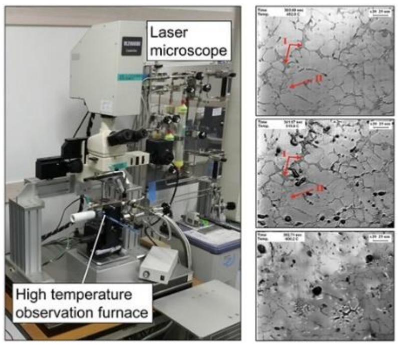
(1) Elucidation for mechanism of microstructural evolution during solidification and solid state in weld metal of stainless steels and carbon steels
(2) Investigation of controlling factor of hot cracking susceptibility and establishment of the prediction technology of the cracking during welding and additive manufacturing
(3) Clarification of influential factors of corrosion resistance of stainless steel welds
(4) Analysis of solidification/transformation behavior and accurate evaluation of hot cracking susceptibility by using In-situ observation technique
(5) Development of improvement technology of properties of weld metal by microstructural control



Evaluation and analysis of hot cracking susceptibility test



Observation of pitting initiation in heat-affected zone by FESEM
(a) α / γ Interface and (b) α -ferrite, (c)Location of pitting initiation



High temperature in-situ observation by laser microscope

Major Papers

Y. Hou, Y. Nakamori, K. Kadoi, H. Inoue and H Baba, “Initiation mechanism of pitting corrosion in weld heat affected zone of duplex stainless steel”, Corrosion Sci., (2022), 110278. doi

M. Sakata, K. Kadoi and H. Inoue, “Mechanism for enhanced age hardening of 22 % Cr duplex stainless steel weld metal fabricated with grade 2209 filler material”, Mater. Today Commun., 33 (2022), 104201. doi

R. Homma, G. Shigesato, M. Fujioka, K. Kadoi and H. Inoue, “Mn Depletion Behavior at Oxide/matrix In Low Oxygen weld of Low Carbon Steel", Tetsu-to-Hagane, 108 (2022), 211-223. doi

Y. Hou, G. Cheng, K. Kadoi, H. Inoue, Q. Ruan, J. Pan and X. Chen, “Formation Mechanism of Stripe Pattern Defect in Cold-Rolled AISI 441 Stainless Steel Stabilized by Ti and Nb”, Metall. Mater. Trans. B, 53 (2022), 2499-2511. doi

Y. Hou, C. Cheng, K. Kadoi and H. Inoue, “Acceleration Mechanism of Ti_2O_3 on TiN Formation and δ-Ferrite Nucleation of Ferritic Stainless Steel”, Journal of Alloys and Compounds, 912 (2022), 165221. doi

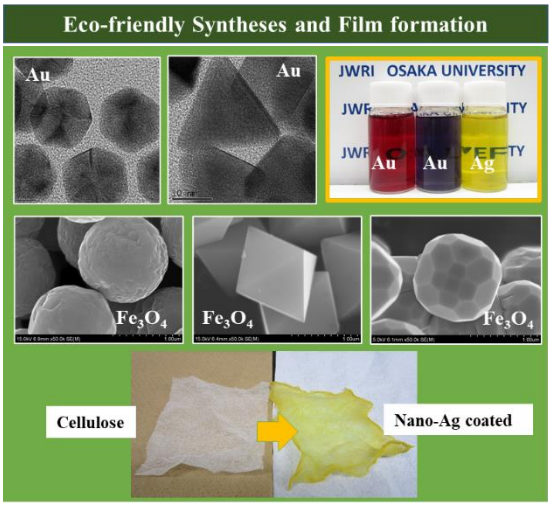
Research Center for Additive Joining Application, Dep. of Green Additive Manufacturing

Research summary

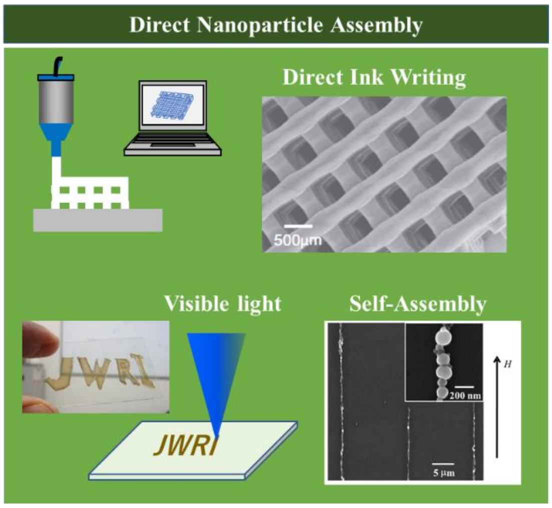
As environmental and energy problems become more serious on a global scale, we are working on research and development of material process technologies and environment-friendly materials that will greatly reduce the environmental load. We recently focus on inorganic nano- and micro-particles as building blocks for functional materials and devices, and we develop low-environmental load methodologies for their syntheses, film formation, bonding, integration, and 3D printing. Furthermore, we are proceeding with research and development of environment and energy related materials and devices using our new process technology.

Research subjects

(1) Eco-friendly solution-based syntheses of nano- and micro-particles
(2) Eco-friendly assemblies of nano- and micro-particles
(3) Development of Environment friendly materials
(4) Development of environmental monitoring devices



(Top) Reductant free synthesis of noble metal nanoparticles (NPs)
(Middle) Shape-controlled synthesis without any additives
(Bottom) Reductant-free coating of noble metal NPs



(Top) Direct Ink Writing of Nanoparticle-Ink
(Left-bottom) Visible-light induced patterning of metal NPs
(Right-bottom) Self-assembly of magnetic NPs under magnetic field

Major Papers

F. Li, S.-K. Sun, Y. Chen, T. Naka, T. Hashishin, J. Maruyama, H. Abe, “Bottom-up synthesis of 2D layered high-entropy transition metal hydroxides”, Nanoscale Adv., 4, (2022), 2468-2478. doi

F. Li, G.-J. Zhang, H. Abe, “Sintering of high-entropy nanoparticles obtained by polyol process: A case study of $(La_{0.2}Y_{0.2}Nd_{0.2}Sm_{0.2}Gd_{0.2})2Ce_2O_{7-\delta}$”, J. Eur. Ceram. Soc., 42, (2022),7538-7545. doi

F. Li, G.-J. Zhang, H. Abe, ”Low-temperature synthesis of high-entropy $(Mg_{0.2}Co_{0.2}Ni_{0.2}Cu_{0.2}Zn_{0.2})O$ nanoparticles via polyol process”, Open Ceramics,9,(2022),100223 doi

T. Hashishin, H. Taniguchi, F. Li, H. Abe, “Useful High-Entropy Source on Spinel Oxides for Gas Detection”, Sensors,22,11(2022),4233-4245 doi

C.-T. Thanh, P.-N.-D. Duoc, P.-V. Trinh, N.-T. Huyen, N.-V. Tu, C.-T. Anh, P.-V. Hai, K. Yoshida, H. Abe, N.-V. Chuc, “3D porous graphene/double-walled carbon nanotubes/gold nanoparticles hybrid film for modifying electrochemical electrode”, Mater. Lett.,330,(2022),133308 doi

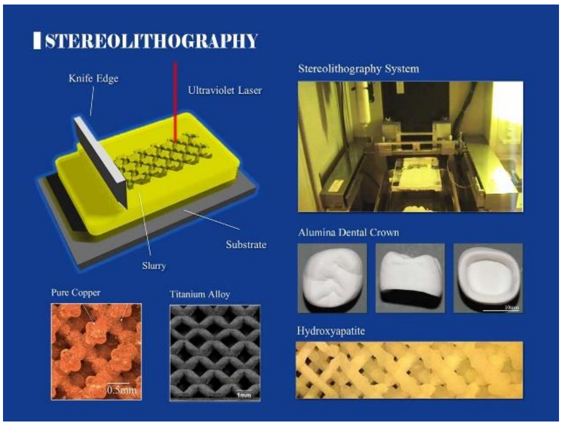
Research Center for Additive Joining Application, Dep. of Lithographic Additive Manufacturing

Research summary

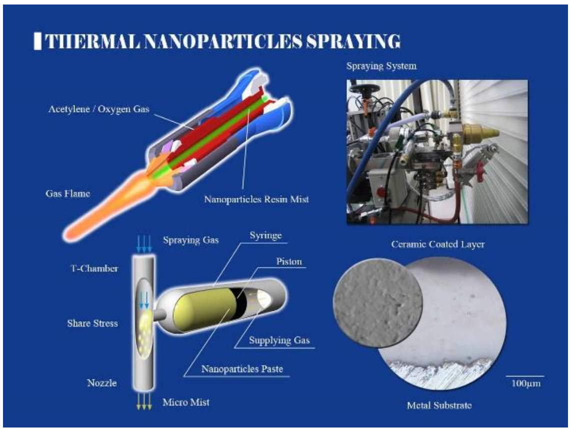
Additive Manufacturing (AM) was newly developed as novel process to create three dimensional (3D) structures through two dimensional (2D) layer laminations. Metal and ceramic nanoparticles were dispersed into resin paste to use for our original process. In lithography techniques, a high power laser beam was scanned on the spread paste for 2D layer drawing and 3D structure forming. In deposition techniques, the paste was introduced into high temperature plasma or gas flame for 2D cladding and 3D patterning. Created electric devices, biological implants and energy modules will contribute to sustainable development.

Research subjects

(1) Stereolithographic Additive Manufacturing of Metal and Ceramic Parts Using Nanoparticles Pastes
(2) Structural Fabrication of Photonic Crystals with Diamond Structures for Terahertz Wave Control
(3) Modulation of Micro Porous Structures in Biological Ceramic Implants for Artificial Metabolism
(4) Manufacturing of Micro Metal Lattices for Effective Controls of Heat Flow and Stress Distributions
(5) Advance Development of Thermal Nanoparticles Spraying for Additive Manufacturing Technique
(6) Fine Separator Formation in Solid Oxide Fuel Cells by Using Thermal Nanoparticles Spraying
(7) Fine Ceramic Coating with Thermal Conductivity and Corrosion Resistance for Heat Exchanger Tubes
(8) Layer Laminations by Fine Particles Spraying and Sintering to Create Functionally Graded Structures



Laser Scanning Stereolithography of Additive Manufacturing to Fabricate Bulky Metal and Ceramic Components with Micro Geometric Patterns



Thermal Spraying Using Fine Particle Pastes to Laminate Metal and Ceramic Coated Layers with Functional Nano/Micro Structures

Major Papers

M. Takahashi, F. Spirrett, S. Kirihara, "Reduction of Dewaxing and Sintering Time by Controlling the Particle Size of YSZ Particles for Stereolithography", Ceramics, 5(2022), 4, 814-820. doi

F. Spirrett, T. Ito, S. Kirihara, "High-Speed Alumina Stereolithography", MDPI Appl. Sci., 12(2022), 19, 9760. doi

S. Kirihara, "Systematic Compounding of Ceramic Pastes in Stereolithographic Additive Manufacturing", Materials, 14, 22 (2021), 1895611-1895945. doi

S. Kirihara, "Stereolithographic Additive Manufacturing of Acoustic Devices with Spatially Modulated Cavities" Int. J. Appl. Ceram. Technol. (2021), 13925-1-13925-8. doi

Research Center for Additive Joining Application, Dep. of Additive Manufacturing Mechanism

Research summary

Laser powder bed fusion (L-PBF), one of additive manufacturing technologies, is based on a rapid solidification process, and enables to form ultra-fine microstructures and supersaturated solution of metal materials, which are effective to improve mechanical properties. This department focuses on clarification of both unique microstructures formation mechanism and their effect on the strength and ductility balance of L-PBF titanium alloys.

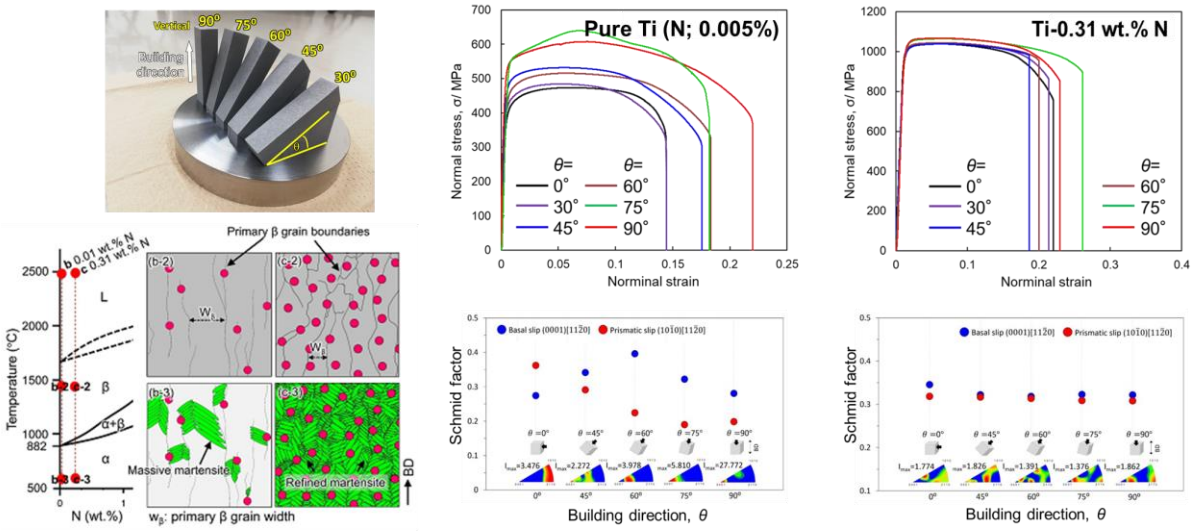
Research subjects

(1) Formation mechanism of unique fine microstructures and orientations of L-PBF Ti alloys

(2) High-strengthen metal matrix composites fabricated by L-PBF process

(3) Strengthening mechanism of L-PBF Ti alloys – grain refining, solid solution and dispersions

(4) Deformation behavior of Gyroid scaffolds L-PBF Ti-Zr alloy and its medical applications



Nitrogen solute-induced near-isotropic performance of laser powder bed fusion manufactured pure titanium. IPF maps of L-PBF Ti samples obtained at different printing orientation angles (θ=0°,30°, 45°, 60°, 75°, 90°) of CP-Ti (0.005% N) and Ti-0.31 wt.%N. A significant anisotropic tensile property of Ti-0.31% N are demonstrated by change in its strength and elongation with increasing POA from 0° to 90° (vertical).

Major Papers

A. Issariyapat, S. Kariya, K. Shitara, J. Umeda and K. Kondoh, "Solute-induced near-isotropic performance of laser powder bed fusion manufactured pure titanium", Addit. Manuf., 56 (2022) 102907. doi

J. Peterson, A. Issariyapat, J. Umeda and K. Kondoh, "The Effects of Heat Treatment and Carbon Content on the Microstructure and Mechanical Properties of Laser Powder Bed Fusion Ti-6Al-4V with Dissolved TiC Particles", J Alloys Compds., 920 (2022) 165930. doi

W. Shi, Y. Yang, N. Kang, M. Wang, B. Chen, Y. Li, J. Umeda, K. Kondoh and J. Shen, "Microstructure and mechanical characterizations of additively manufactured high oxygen-doped titanium", Mater. Charact., 189 (2022) 112008. doi

J. Wan, H. Geng, B. Chen, J. Shen, K. Kondoh and J. Li, "Evading ductility deterioration in aluminum matrix composites via intragranulation of nano-reinforcement by reactive selective laser melting", Mater. Sci. Eng. A, 863 (2022) 144552. doi

L. Zhang, C. Hu, Y. Yang, R.D.K. Misra, K. Kondoh and Y. Lu, "Laser powder bed fusion of cemented carbides by developing a new type of Co coated WC composite powder", Addit. Manuf., 55 (2022) 102820 doi

Research Center for Additive Joining Application, Dep. of Laser Additive Manufacturing

Research summary

In this department, fundamental studies on laser additive manufacturing (LAM) are performed and apparatuses for LAM are developed.

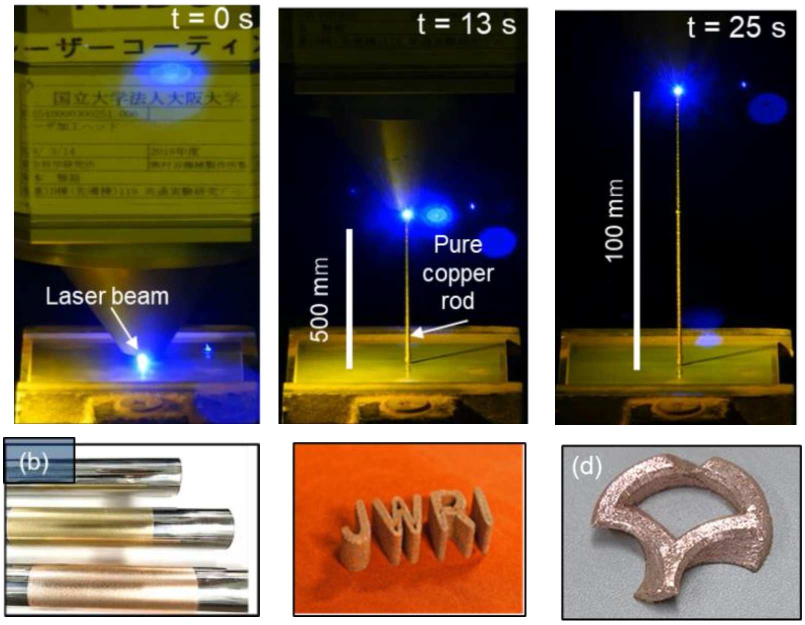
In particular, the apparatuses installed with high power blue diode lasers are also developed since those lasers enable stable and high efficient melting of metal materials such as copper.

Furthermore, in order to realize high-quality and high-speed LAM, we will experimentally and theoretically proceed with the analysis of the melting and solidification process of the material by laser irradiation.

Utilizing the obtained knowledge, we will work on the creation of innovative LAM processes and the development of equipment and promote their social implementation.

Research subjects

(1) Development of additive manufacturing technologies with blue laser
(2) Elucidation of laser interaction with metal powders for LAM
(3) Creation of new function by laser metal deposition
(4) Elucidation of melting and solidification phenomena in LAM process



Additive manufacturing of copper using blue diode laser (a)3D rod formation (b) Micro-coating of copper alloy (c) JWRI logo by SLM (d) Osaka University's school emblem by SLM

Major Papers

Y. Sato, Y. Morimoto, K. Ono, K. Takenaka, T. Kamata, M. Heya, and M. Tsukamoto, "Copper Alloy Layer Formation with Multi Beam Type Laser Coating with Blue Diode Lasers", IEEJ Trans. Elec., Infor.Sys., 142(10)(2022), 1075-1080.
doi

K. Takenaka, Y. Sato, N. Yoshida, M. Yoshitani, M. Heya and M. Tsukamoto, "Additive manufactured of pure copper by blue diode laser induced selective laser melting" J. Laser Appl., 34(4) (2022) , 042041.
doi

M. Ihama, Y. Sato, Y. Mizuguchi, N. Yoshida, S. Srisawadi, D. Tanprayoon, T. Suga and M. Tsukamoto "Suppression of denudation zone using laser profile control in vacuum selective laser melting", J. Laser Appl., 35 (2022), 012004.
doi

Y. Mizuguchi, M. Ihama, Y. Sato, N. Yoshida, S. Srisawadi, D. Tanprayoon, and Tsukamoto, "Effect of modulated pulses on the fabrication of Ti-6al-4v by spatter-less selective laser melting in vacuum." Appl. Phys. A.,128(10) (2022), 939.
doi

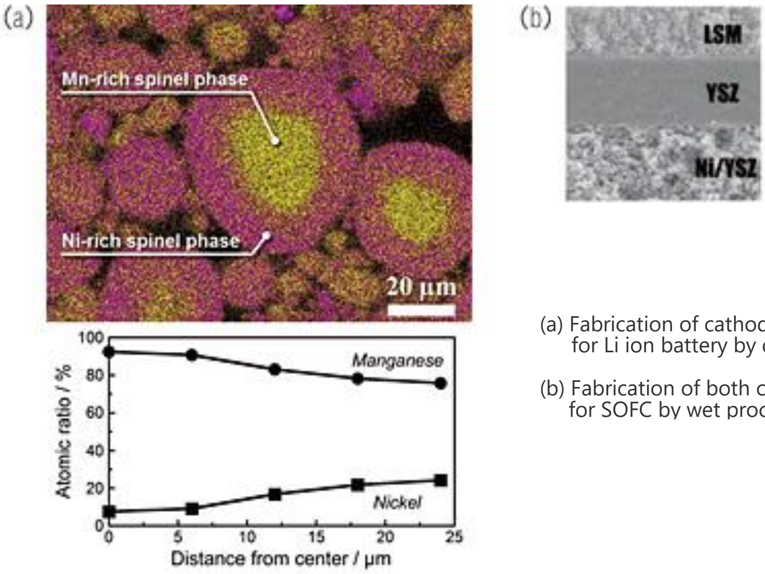
Research Center for Additive Joining Application, Dep. of Advanced Additive Manufacturing

Research summary

This department deals with smart coating processing based on nanoparticle processing, which leads to advanced manufacturing technology as well as safe, security, environmental and energy issues. By making use of new properties of nanoparticles, nanoporous or multi-component films can be created without any heat assistance. Nano and microscale design of particles will lead to high reliability and functional coating films with various kinds of coating processes. Smart coating on the surface of particles will make key materials for new areas such as DDS (Drug Delivery System) or Fuel Cells.

Research subjects

(1) Development of solid-state processing in water vapor for functional fine-particle synthesis
(2) Low temperature synthesis of composite oxide nanoparticles by mechanochemical method
(3) Development of Li ion battery electrodes by controlling their composite structure
(4) Wet processing for composite nanoparticles and their applications for fuel cells
(5) Development of fuel cell electrodes for PEFC and SOFC
(6) Development of low thermal conductivity materials using composite particles
(7) Development of 3D direct-assembly process of nanoparticles
(8) New recycling process of composite materials by bonding and disassembling of their interface



(a) Fabrication of cathode particle with gradient composition for Li ion battery by dry processing

(b) Fabrication of both cathode and anode nanostructure for SOFC by wet processing

Major Papers

D.-W. Tan, Z.-Y. Lao, W.-M. Guo, A. Kondo, T. Kozawa, M. Naito, K. Plucknett, H.-T. Lin, "Fabrication and modelling of Si_3N_4 ceramics with radial grain alignment generated through centripetal sinter-forging", J. Mater. Sci. Technol., 126 (2022), 1-14.
doi

A. Kondo, T. Kozawa, T. Ishii, J. Kano, M. Naito, "Mechanical Synthesis of Lithium Titanate Hydrate in Liquid Phase Using a Bead Mill", J. Soc. Powder. Technol. Japan., 59 (2022), 324-330.
doi

A. Kondo, T. Kozawa, T. Ishii, M. Naito, "Wet milling synthesis of ammonium cobalt phosphate hydrate platelets for LCP-olivine cathodes for LIB using a bead mill", Int. J. Appl. Ceram. Technol. (2022) .
doi

T. Kozawa, F. Kitabayashi, K. Fukuyama, M. Naito, "Carbon nanoparticle-entrapped macroporous Mn_3O_4 microsphere anodes with improved cycling stability for Li-ion batteries", Sci. Rep., 12 (2022), 11992.
doi

Joint Interface Microstructure Characterization Room

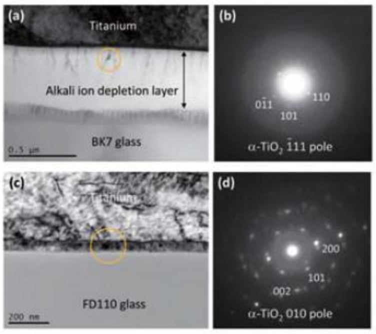
Research summary

In order to clarify the effect of material structure on the properties of joints joined by various methods and new materials made by applying joining technology, their microstructures are examined using a transmission electron microscope (TEM). TEM observation provides various information such as the crystal structure, chemical composition, properties and distribution of lattice defects in minute areas. We also support the preparation of specimens for TEM observation from difficult-to-process joint structures, etc., using various means such as focused ion beam (FIB) processing. In addition to TEM sample preparation, we develop methods for micromechanical testing of materials using FIB processing and apply them to strength evaluation of joint structures.

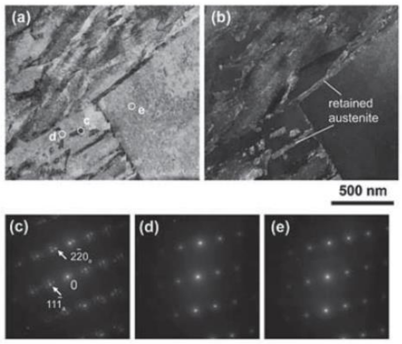
As a unique activity of the analysis room, we perform basic study on the bonding mechanism of anodic bonding, which is a method of bonding glass to conductors at relatively low temperatures, and develop new bonding methods and high-function bonding interfaces by applying that knowledges.

Research subjects

(1) Microstructural analysis of various bonding interfaces and material structures
(2) Fundamental research on the anodic bonding process of glass to various metals
(3) High functionalize of glass-to-glassanodic bonding interfaces
(4) Development of new bonding methods that applies the principle of anodic bonding



Reaction products that grew at joint interfaces between titanium and optical glasses. The bright-fi eld image of BK7 crown glass/titanium joint interface by transmission electron microscopy (a), Selected Area electron Diff raction (SAD) pattern taken from the area indicated by a circle in the image a (b), bright-field image of FD110 dense flint glass/titanium joint interface (c), and SAD pattern taken from the area indicated by a circle in the image c (d). These reaction products were found to consist of α-TiO_2 . However, those forms are strongly aff ected by types of glass.



Distribution of retained austenite in 980 MPa high-tensile steel. (a) Bright-field image, (b) dark-field image taken by 111 reflection from austenite indicated in the diff raction pattern in (c), and (c)-(e) selected-area electron diff raction patterns taken from positions indicated in the bright -fi eld image in (a). Austenite appears bright between ferrite laths in the dark-fi eld image.

Major Papers

Makoto Takahashi, "Effect of Bonding Voltage on the Progress of Glass-to-glass Anodic Bonding Using a Conductor Layer as an Intermediary" (In Japanese), 28th Symposium on "Microjoining and Assembly Technology in Electronics, held on February online.

Global Diversity and Inclusion Promotion Office

Summary

Global D&I (Diversity & Inclusion) Promotion Office promotes the development of an environment that maximizes the strengths of Joining and Welding Research Institute (JWRI) and all members by truly embracing diversity and respecting the individuality of each person, regardless of gender, nationality, age, cultural background, etc., in order to achieve the SDGs, which aim to realize a society where "no one is left behind". In response to the trend toward internationalization in academic research, JWRI will develop international joint industry-academia research based on the international network we have established to date. JWRI aims to develop competent human resources to face global challenges, to strive to stimulate innovation in joining science as the world-leading research in the field of welding and joining, and to realize the institute where diverse human resources can play an active role.

In FY 2022, major activity that Global D&I Promotion Office has worked on was the strengthening international collaboration through establishing the research institute under collaboration with Hanoi University of Science and Technology (HUST) in Vietnam. Receiving various supports and funds from Japanese and Vietnamese Government as well as from industries, "Joining and Welding Research Institute HUST-OU" has been established in January 2023. It is expected that new institute will broaden the diversity of the JWRI through active international joint research and through exchange of the researchers and students in Southeast Asia.

Another activity was focused on diversifying human resources with regards to gender and global perspective in order to enhance outcomes for further diversity and inclusion within JWRI.

Activities

(1) Increase Global Diversification: Strengthen International Collaboration Research; Establishing the "Joining and Welding Research Institute HUST-OU"; Create and activate foundation of International Industry-Academia Collaboration; Increase number and quality of Welding Engineers in Vietnam and in Southeast Asia.

(2) Increase Gender Diversification: Bring together students, faculty and staff from different roles and positions; Organize "International Seminar on Materials Science in 2022~ SDGs Seminar 2022 Autumn ~" with Okayama University.

Table.1. List of activities and projects for Global Diversification

Name	Contents
Establishing "Joining and Welding Research Institute HUST-OU"	January 10th, 2023: Establishment Ceremony was held at HUST in Hanoi, Vietnam
Vietnam Welding Research Club	Tow Seminars were held: 1) November 10th, 2022 in Hanoi, Vietnam (Hybrid) 2) February 10th, 2023 in Hai Phong, Vietnam
New Industry-Academia Collaboration	Concluded on January 10th, 2023: Kobe Steel; Thai KOBELCO Welding; HUST; JWRI.
Japan International Cooperation Agency (JICA) Partnership Program	Strengthening training and education capacity on Welding Engineers at HUST (preparing for kick-off)

Seminar with members of Vietnam Welding Research Club

Establishment Ceremony of "JWRI HUST-OU"

Osaka Fuji "Advanced Functional Processing" Joint Research Chairs

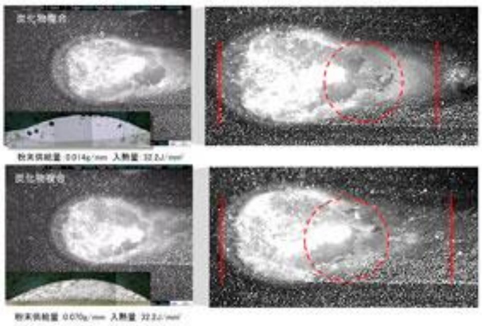
Research summary

This research chair aims to develop advanced functional processing technics by combining laser processing technology and materials knowledge in JWRI and advanced functional manufacturing technologies of Osaka Fuji Corporation.

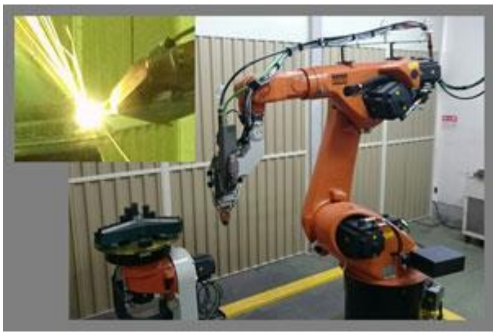
The main purpose is to develop the surface functioning of various materials by laser cladding method, low weldability materials. Finally, these fruits are applied to the next generation of manufacturing technology for various industrial fields.

Research subjects

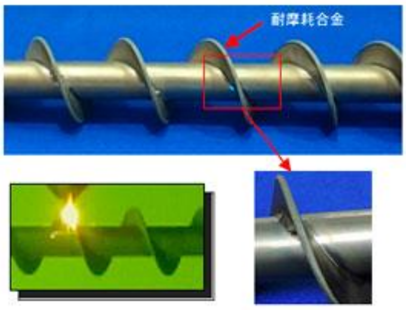
(1) Development of highly functional surface by laser cladding
(2) Development of functional surfaces of small or thin parts
(3) Development of hybrid technology of laser and conventional surfacing technologies
(4) Fundamental research of laser additive manufacturing technology



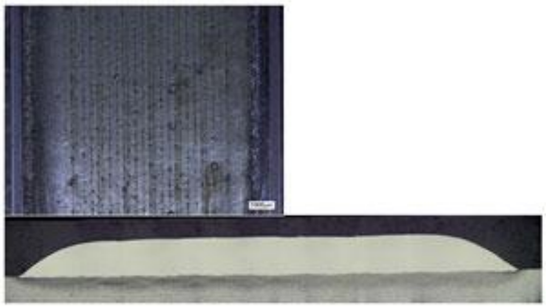
Dynamic observation of molten pool behavior for analysis of blow halls formation using high-speed camera



Experimental apparatus for laser cladding



Example of laser cladding on edge of screw



Wide, flat cladding layer which was provided by beam control

Major Papers

K. Morimoto, Y. Sato, K. Takenaka, Y. Funada, Y. Hayashi, N. Abe and M. Tsukamoto, "Effect of particle size distribution on pure copper layer formation in a multi-beam laser cladding system with pure copper powder and two blue diode lasers", Appl. Phys. A-Mater. Sci. Process., 129 (2022), 12.

doi

T. Arita, Y. Sato, Y. Kurita, M. Mizutani, H. Nakano and M. Tsukamoto, "In situ observation of dynamics of keyhole and molten pool in laser welding for development of spatter suppression", J. Laser Appl., 34 (2022), 32017.

doi

T. Arita, Y. Kurita, M. Mizutani, Y. Sato, H. Nakano and M. Tsukamoto, "Experimental study on mechanism of spatter generation in keyhole welding using 16kW disk laser", Proc. SPIE, (2022), 119880G-1-119880G-6.

doi

Design & Engineering by Joint Inverse Innovation for Materials Architecture – DEJI²MA Project –

Research summary

The Project, Design & Engineering by Joint Inverse Innovation for Materials Architecture - DEJI²MA Project -, has started from 2021 as inter-university cooperative research project (Osaka Univ., Tohoku Univ., Tokyo Institute of Tech., Nagoya Univ., Tokyo Medical and Dental Univ., Waseda Univ.). This project promotes the joint research for development of Inverse Innovation Materials for applications in such as environmental, energy and biomedical fields through the inter-university cooperative researches by the 6 research institutes at 6 universities.

Research subjects

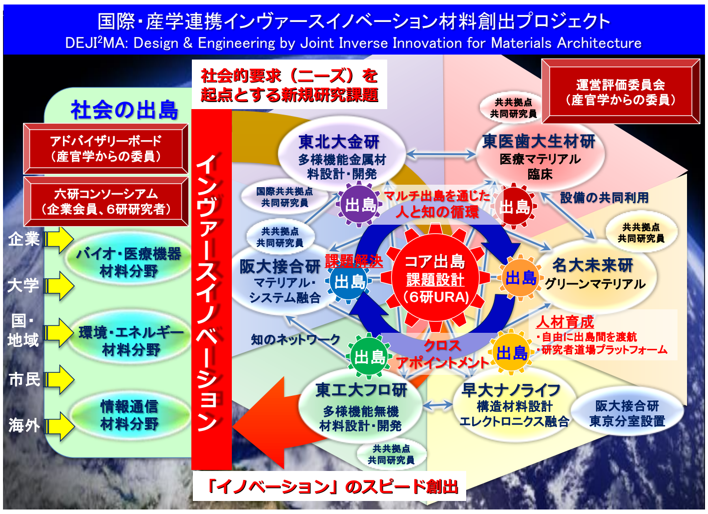
(1) Environmental and Energy Materials
(2) Biomedical and Healthcare Materials
(3) Information and Communication Materials

6 universities cooperative research project

(1) Joining and Welding Research Institute, Osaka Univ.
(2) Institute for Materials Research, Tohoku Univ.
(3) Laboratory for Materials and Structures, Tokyo Institute of Tech.
(4) Institute of Materials and Systems for Sustainability, Nagoya Univ.
(5) Institute of Biomaterials and Bioengineering, Tokyo Medical and Dental Univ.
(6) Research Organization for Nano & Life Innovation, Waseda Univ.

Research topics

(1) Synthesis and integration of ceria nanocubes towards environmental and energy applications
(2) Synthesis and coating of titan oxide nanocrystals towards biomedical applications



Cooperation system of the six research institutes at six universities

Major Papers

S. Ohara, T. Naka, T. Hashishin, "Ferromagnetism and exchange bias in compressed ilmenite–hematite solid solution as a source of planetary magnetic anomalies", Sci. Adv., 8, (2022), 1-5.

doi

CONTRIBUTIONS TO OTHER ORGANIZATIONS

(January 2022 ~ December 2022)

[Physics, Processes, Instruments & Measurements]

M. TANAKA
We Must Learn the Present by Studying the Past
J. Smart Process., 11, 1 (2022), 1-2 (in Japanese).

M. TANAKA
Towards Cultivating Intersection between Diverse Human Resources and Knowledges
J. Japan Inst. Elncs. Pcag., 25, 1 (2022), 1 (in Japanese).

M. TANAKA
Transformative Change in the IIW Annual Assembly and International Conference
Welding Technol., 70, 6 (2022), 106-109 (in Japanese).

M. TANAKA
Introduction to Welding Technology
Textbook for HPI Technology Seminar, (2022), 127-166 (in Japanese).

M. TANAKA
2021 JWS Activities
J. Japan Welding Soc., 91, 5 (2022), 321-322 (in Japanese).

S. KOZUKI, T. OKABE, S. IGI and M. TANAKA
Narrow Gap Welding Process for Heavy Thick Steel Plates with CO_2 Gas Shielded Arc Welding using REM Addition Wire
75th Annual Assembly of Int. Inst. Welding (IIW), (2022), IIW Doc. XII-2490-2022.

Y. ABE, T. FUJIMOTO, M. NAKATANI, M. SHIGETA and M. TANAKA
Effect of Welding Condition on Fracture Toughness for Ultra-Narrow Gap Submerged Arc Welding
75th Annual Assembly of Int. Inst. Welding (IIW), (2022), IIW Doc. XII-2524-2022.

M. TANAKA
Introduction to Welding Process
Textbook for Summer School of Welding Engineering, (2022), 1-28 (in Japanese).

M. TANAKA
New Initiative in the IIW Annual Assembly and International Conference
Welding Technol., 70, 10 (2022), 85-89 (in Japanese).

S. ASAI, M. TANAKA, S. KODAMA, K. KADOI, Y. FUJITA, N. MUKAI, F. MIYASAKA, K. NOMURA, Y. OGINO, S. YAMANE and H. SHIMIZU
Round-table-talk on Seminar for Book "Shin-Phenomena of Welding Arcs"
Welding Technol., 70, 10 (2022), 101-107 (in Japanese).

M. TANAKA
On the Issue of the 60th Anniversary of the Foundation
J. Light Metal Welding, 60, 10 (2022), 419 (in Japanese).

S. MAMAT, N. -A. SIDEK, N. -A. -A. -M. AFANDI, R. -A. -E. ROSLAN, T. -P. TER, T. YUJI, S. TASHIRO and M. TANAKA
Observation of Microstructure and Mechanical Properties in Heat Affected Zone of As-Welded Carbon Steel by Using Plasma MIG Welding Process
Metals, 12 (2022), 315.

S. TASHIRO, S. -B. MAMAT, A. -B. MURPHY, T. YUJI and M. TANAKA
Numerical Analysis of Metal Transfer Process in Plasma MIG Welding
Metals, 12 (2022), 326.

L. XIAO, D. FAN, J. HUANG, S. TASHIRO and M. TANAKA
Mild Steel Metal Rotating Spray Transfer Behavior in Magnetically Controlled Gas Metal Arc Welding
Mater. Today Commun., 31 (2022), 103352.

K. ISHIDA, S. TASHIRO, K. NOMURA, D. WU and M. TANAKA
Elucidation of Arc Coupling Mechanism in Plasma-MIG Hybrid Welding Process through Spectroscopic Measurement of 3D Distributions of Plasma Temperature and Iron Vapor Concentration
J. Manufacturing Processes, 77 (2022), 743-753.

F. Jiang, Q. Miao, B. Xu, S. Tashiro, M. Tanaka, S. Lin, C. Fan and S. Chen
Numerical Analysis of Physical Characteristics and Heat Transfer Decoupling Behavior in Bypass Coupling Variable Polarity Plasma Arc
Materials, 15 (2022), 3174(19pp).

F. Jiang, Q. Miao, Y. Zhang, B. Xu, S. Tashiro, M. Tanaka and S. Chen
Effect of Pumping Gas on Temperature Field and Pressure in Hollow Tungsten Arc
Int. J. Therm. Sci., 179 (2022), 107662 (13pp).

Z. Li, D. Wu, S. Tashiro, M. Tanaka, J. Xin, H. Wang and X. Hua
Influence Mechanism of Metal Vapor in Plasma Arc Lap Welding-Metal Vapor Decreases Arc Energy Efficiency in Conduction Plasma Arc Lap Welding-
Weld. J., 101 (2022), 161-s-171-s.

S. -M. Hong, S. Tashiro, H. Bang and M. Tanaka
Weldability of Dissimilar Materials (AA5052 Aluminium Alloy - Galvannealed High Strength Steel) Joints by Direct Current Pulsed Gas Metal Arc Welding
AIP Conf. Proc., 2454 (2022), 060036-1-060036-5.

R. -A. -E. Roslan, S. Mamat, P. -T. Teo, F. MOHAMAD, Y. Toshifumi, S. Tashiro and M. Tanaka
Numerical Simulation of Arc Behaviour in TIG/MIG Hybrid Welding Process of Aluminium Alloy
AIP Conf. Proc., 2454 (2022), 060009-1-060009-9.

N. -Q. Trinh, S. Tashiro, T. Suga, T. Kakizaki, K. Yamazaki, T. Morimoto, H. Shimizu, A. Lersvanichkool, H. -V. Bui and M. Tanaka
Effect of Flux Ratio on Droplet Transfer Behavior in Metal-Cored Arc Welding
metals, 12 (2022), 1069 (13pp).

N. -Q. Trinh, S. Tashiro, T. Suga, T. Kakizaki, K. Yamazaki, T. Morimoto, H. Shimizu, A. LERSVANICHKOOL, H. -V. BUI and M. TANAKA
Effect of Flux Ratio on Droplet Transfer Behavior in Metal-Cored Arc Welding
IIW Annual Assembly, 2022 (USB), (2022), IIW 2022 - Doc. XII-2527.

N. -Q. Trinh, S. Tashiro, T. Suga, T. Kakizaki, K. Yamazaki, A. Lersvanichkool, H. -V. Bui and M. Tanaka
Metal Transfer Behavior of Metal-Cored Arc Welding in Pure Argon Shielding Gas
metals, 12 (2022), 1577 (13pp).

S. -M. Hong, T. Shinichi, B. -H. Seon and T. Manabu
Effect of Gap Bridging Distance on the Weldability of Aluminum Alloy to Galvanized Steel Joints in AC Pulse GMAW
Met. Mater. -Int., (2022).

D. Wu, K. Ishida, S. Tashiro, K. Nomura, X. Hua, N. Ma and M. Tanaka
Dynamic Keyhole Behaviors and Element Mixing in Paraxial Hybrid Plasma-MIG Welding with a Gap
Int. J. Heat Mass Transf., 200 (2022), 123551 (12pp).

G. Uchida, K. Nagai, Y. Habu, J. Hayashi, Y. Ikebe, M. Hiramatsu, R. Narishige, N. Itagaki, M. Shiratani and Y. Setsuhara
Nanostructured Ge and GeSn Films by High-pressure He Plasma Sputtering for High-capacity Li Ion Battery Anodes
Sci. Rep., 1742 (2022).

K. Takenaka, R. Machida, T. Bono, A. Jinda, S. Toko, G. Uchida and Y. Setsuhara
Development of a Non-Thermal Atmospheric Pressure Plasma-Assisted Technology for the Direct Joining of Metals with Dissimilar Materials
J. Manufacturing Processes, 75 (2022), 664-669.

S. Nunomura, K. Kamataki, T. Nagai, T. Misawa, S. Kawai, K. Takenaka, G. Uchida and K. Koga
Plasma Synthesis of Silicon Nanoparticles: From Molecules to Clusters and Nanoparticle Growth
IEEE Open J. Nanotechnol., 3 (2022), 94-100.

S. Toko, M. Ideguchi, T. Haseagawa, T. Okumura, K. Kamataki, K. Takenaka, K. Koga, M. Shiratani and Y. Setsuhara
Effect of Gas Flow Rate and Discharge Volume on CO_2 Methanation with Plasma Catalysis
Jpn. J. Appl. Phys., 61 (2022), SI1002/1-SI1002/6.

S. HSU, C. CHEN, J. SONG and H. NISHIKAWA
Surface Modification of Cu Electroplated Layers for Cu-Sn Transient Liquid Phase Bonding
Mater. Chem. Phys., 277 (2022), 125621.

H. NISHIKAWA, Y. HIRATA, C. YANG and S. LIN
Effect of Low Bi Content of Reliability of Sn-Bi Alloy Joints before and after Thermal Aging
JOM, Online (2022).

J. JHANA, K. WATAYA, H. NISHIKAWA and C. CHEN
Electrodeposition of Nanocrystalline Cu for Cu-Cu Direct Bonding
J. Taiwan Inst. Chem. Eng., 132 (2022), 10417.

J. WANG, S. XUE, L. LIU, P. ZHANG and H. NISHIKAWA
Three-dimensional Interface and Property of SnPb Solder Joint under Extreme Thermal Shocking
Sci. Technol. Weld. Joining, 27, 3 (2022), 186-196.

S. HOMMA, Y. TAKANO, T. WATANABE, K. MURAKAMI, M. FUKUDA, T. IMOTO and H. NISHIKAWA
Adhesion Mechanism between Mold Resin and Sputtered Stainless Steel Ground Films for Electromagnetic Wave Shield Packages
Mater. Trans., 63, 6 (2022), 766-775.

B. PARK, D. -L. HAN, M. SAITO, J. MIZUNO and H. NISHIKAWA
Effect of Various Parameters on the Shear Strength of Solid-State Nanoporous Cu Bonding in Cu-Cu Disks for Power Device Packaging
J. Electronic Mater., 51, 7 (2022), 3851-3862.

J. WANG, X. LIU, F. HUO, K. KARIYA, N. MASAGO and H. NISHIKAWA
Novel Transient Liquid Phase Bonding Method Using In-coated Cu Sheet for High-Temperature Die Attach
Mater. Res. Bull., 149 (2022), 111713.

B. PARK, M. SAITO, J. MIZUNO and H. NISHIKAWA
Robust Shear Strength of Cu-Au Joint on Au Surface-Finished Cu Disks by Solid-State Nanoporous Cu Bonding
Microelectron. Eng., 260 (2022), 111807.

C. YANG, Y. LIU, Y. HIRATA, H. NISHIKAWA and S. LIN
Mechanical Properties of Sn-Bi-Ag Low-Temperature Pb-free Solders
Proc. 2022 Int. Conf. on Electronics Packaging (ICEP2022), (2022), 37-38.

Y. LIU, C. CHEN, M. UESHIMA, T. SAKAMOTO, T. NAOE, H. NISHIKAWA and K. SUGANUMA
Reliability Evaluation on Ag Sintering Die Attach for SiC Power Modules During Long-term Thermal Aging/cycling
Proc. 2022 Int. Conf. on Electronics Packaging (ICEP2022), (2022), 49-50.

Z. JIN, F. HUO, X. LIU and H. NISHIKAWA
Electromigration Comparison Study of Sn, Ag, and Cu Stripes Fabricated by Electron-Beam Physical Vapor Deposition
Proc. 2022 Int. Conf. on Electronics Packaging (ICEP2022), (2022), 203-204.

C. YANG, Y. LIU, Y. HIRATA, H. NISHIKAWA and S. LIN
High-strength Sn-Bi-based Low-Temperature Solders with High Toughness Designed via High-Throughput Thermodynamic Modelling
Sci. Technol. Weld. Joining, 27, 7 (2022), 572-578..

T. KUZUYA, T. TAKEDACHI, T. ANDO, Y. MATSUNAGA, R. KOBAYASHI, Y. SHIMOTORI, N. NAKAZATO, H. NISHIKAWA and T. NAOE
Synthesis of Hierarchical Structured Cu-Sn Alloy Mesoparticles and Its Application of Cu-Cu Joint Materials
Mater. Trans., 63, 6 (2022), 794-799.

S. HOMMA, M. SHIMA, Y. TAKANO, T. WATANABE, K. MURAKAMI, M. FUKUDA, T. IMOTO and H. NISHIKAWA
Adhesion Mechanism between Mold Resin and Sputtered Copper for Electromagnetic Wave Shield Packages
Thin Solid Films, 750 (2022), 139188.

T. WANG, K. YASUDA and H. NISHIKAWA
Fabrication of Micron-Sized Protrusions on Metal Surface for Metal/polymer Easy-Disassembly Joining by Selective Laser Melting Technology
Mater. Des., 220 (2022), 110873.

H. NISHIKAWA
Sintered Bonding Process Using Surface Nanostructured Materials for Die Bonding
Kagaku to Kogyu, 96, 8 (2022), 232-239 (in Japanese).

H. NISHIKAWA, Y. HIRATA, C. YANG and S. LIN
Effect of Low Bi Content on Mechanical Properties of Sn-Bi-Zn-In Alloy and Its Joint with Cu
Proc. 2022 9th Electonics System-Integration Technology Conf., (2022), 146-1-146-4.

H. TATSUMI, C. -R. KAO and H. NISHIKAWA
Solid-State Bonding Behavior between Surface-Nanostructured Cu and Au: A Molecular Dynamics Simulation
Sci. Rep., 12 (2022), 12755.

H. TATSUMI, S. KANESHITA, Y. KIDA, Y. SATO, M. TSUKAMOTO and H. NISHIKAWA
Highly Efficient Soldering of Sn-Ag-Cu Solder Joints Using Blue Laser
J. Manufacturing Processes, 82 (2022), 700-707.

M. TSUKAMOTO
BLUE LASER ADDITIVE MANUFACTURING OF METAL
DIE AND MOULD TECHNOLOGY, 37, 6 (2022), 18-21 (in Japanese).

M. TSUKAMOTO, Y. SATO, R. HIGASHINO, K. TAKENAKA, E. HORI, S. OUCHI, K. ASANO and K. TOJO
ADDITIVE MANUFACTURING WITH HIGH INTENSITY BLUE DIODE LASER
J. Smart Proc. Mater., 11, 4 (2022), 158-162 (in Japanese).

P. TIM, P. -C. LIN, W. MISIOLEK, J. WEI, S. MASUNO, M. TSUKAMOTO, E. HORI, Y. SATO, Y. TAO, D. YUDHISTIRO and S. YUNUS
Laser Welding of Commercially Pure Titanium Foils.
Quantum Beam Sci., 6 (2022), 1-11.

K. MORIMOTO, Y. SATO, K. TAKENAKA, M. MIZUTANI, K. TOJO, Y. HAYASHI, K. AZUMI, N. ABE and M. TSUKAMOTO
Development of High Speed Pure Copper Layer Formation Technology Using Multi Beam Laser Cladding System with High Intensity Blue Diode Lasers
J. Japan Laser Proc. Scy., 29, 1 (2022), 23-30 (in Japanese).

Y. SATO
Report on ICALEO$_2$021
J. Japan Laser Proc. Scy., 29, 1 (2022), 37-39 (in Japanese).

H. KOSHIJI, T. OHKUBO, T. SHIMOYAMA, T. NAGAI, E. MATSUNAGA, Y. SATO and T. DINH
Analysis of Vase Shaped Pumping Cavity for Solar-Pumped Laser
J. Adv. Comput. Intell. and Intell. Inform., 25, 2 (2022), 242-247.

W. SHI, T. KANAMOTO, M. AIHAR, S. OKA, S. KURODA, T. NAKAI, T. MAZUKA, K. TAKENAKA, Y. SATO, M. TSUKAMOTO, K. EBINA and K. NAKATA
Articular Surface Integrity Assessed by Ultrasound Is Associated with Biological Characteristics of Articular Cartilage in Early-Stage Degeneration
Scientific Rep. vol., 12 (2022), 11970.

S. OTANI, T. KANAMOTO, S. OYAMA, S. YAMAKAWA, W. SHI, R. MIYAZAKI, M. AIHARA, S. OKA, S. KURODA, T. NAKAI, K. TAKENAKA, Y. SATO, M. TSUKAMOTO, A. TSUJII, K. EBINA, S. OKADA and K. NAKATA
Meniscus Surface Texture Is Associated with DegeneMeniscus Surface Texture Is Associated with Degenerative Changes in Biological and Biomechanical Propertiesrative Changes in Biological and Biomechanical Properties
Scientific Rep. vol., 12 (2022), 11977.

T. OHKUBO, T. SENDA, E. MATSUNAGA and Y. SATO
Numerical Simulation of a Laser-induced Bubble of New Laser Propulsion Method Inhaling Water
Appl. Phys. A, 128 (2022), 811-1-811-8.

T. ARITA, Y. SATO, Y. KURITA, M. MIZUTANI, H. NAKANO and M. TSUKAMOTO
In Situ Observation of Dynamics of Keyhole and Molten Pool in Laser Welding for Development of Spatter Suppression
J. Laser Appl., 34 (2022), 32017.

Y. SATO and M. TSUKAMOTO
Development of Multi Beam Laser Metal Deposition with Blue Diode Lasers for Multi-Material
Review Laser Eng., 50, 9 (2022), 504-509 (in Japanese).

K. TAKENAKA, Y. SATO and M. TSUKAMOTO
Effect of Polymer Permittivity on Periods of LIPSS Formed on Titanium with Femtosecond Laser Pulses.
Appl. Phys. A, 128 (2022), 881..

K. MAEDA, R. SUZUKI, Y. SATO, T. SUGA and M. TSUKAMOTO
Developing Laser Welding of Steel to Aluminum for Body Weight Reduction of Transportation Equipment
Review Laser Eng., 50 (2022), 515-519 (in Japanese).

Y. YAMASHITA, T. KUNIMINE, Y. SATO, Y. FUNADA and M. TSUKAMOTO
Formation of Compositionally Graded Cemented Carbides by Multi Beam Laser Metal Deposition
Review Laser Eng., 50 (2022), 527-531 (in Japanese).

Y. MIZUGUCHI, M. IHAMA, Y. SATO, N. YOSHIDA, S. SRISAWADI, D. TANPRAYOON and M. TSUKAMOTO
Effect of Modulated Pulses on the Fabrication of Ti-6al-4v by Spatter-Less Selective Laser Melting in Vacuum
Appl. Phys. A, 128 (2022), 939.

Y. SATO, Y. MORIMOTO, K. ONO, K. TAKENAKA, T. KAMATA, M. HEYA and M. TSUKAMOTO
Copper Alloy Layer Formation with Multi Beam Type Laser Coating with Blue Diode Lasers
IEEJ Trans. Electr. Infor. & Systm., 142 (2022), 1075-1080 (in Japanese).

K. MAEDA, Y. SATO, K. TAKENAKA, S. FUJIO, R. SUZUKI, T. SUGA and M. TSUKAMOTO
Behavior of Melt Flow and Porosity Formation in Laser Welding of Steel to Aluminum with Cold-Sprayed Steel Interlayer
J. Laser Appl., 34 (2022), 42033.

K. TAKENAKA, Y. SATO, S. FUJIO, K. NISHIDA, R. ITO, E. HORI, S. KATO, M. SUWA, S. UNO, K. TOJO and M. TSUKAMOTO
Bead-on-plate Welding of Pure Copper with a 1.5-kW High-Power Blue Diode Laser
Weld. World, 67 (2022), 99-107..

K. TAKENAKA, Y. SATO, N. YOSHIDA, M. YOSHITANI, M. HEYA and M. TSUKAMOTO
Additive Manufactured of Pure Copper by Blue Diode Laser Induced Selective Laser Melting
J. Laser Appl., 34 (2022), 42041.

M. IHAMA, Y. SATO, Y. MIZUGUCHI, N. YOSHIDA, S. SRISAWADI, D. TANPRAYOON, T. SUGA and M. TSUKAMOTO
Suppression of Denudation Zone Using Laser Profile Control in Vacuum Selective Laser Melting
J. Laser Appl., 35 (2022), 12004.

H. SERIZAWA, Y. SATO, M. TSUKAMOTO, T. NOZAWA and H. TANIGAWA
Laser Cladding of Copper Powder on Tungsten for Divertor in ITER By Multiple Laser Beams Focusing System
J. Japan Laser Proc. Scy., 29, 2 (2022), 22-28 (in Japanese).

Y. SUGIMOTO, S. MINEOKA and H. SERIZAWA
Friction Stir Spot Welding and Its Weld-Bond of Aluminum Alloy and CFRP
J. Japan Inst. Lgt. Metls., 72, 10 (2022) (in Japanese).

T. KOZAWA
Microstructural Development of $MnCO_3$ Microsphere Compacts through Hydrothermal Hot-Pressing
J. Eur. Ceram. Soc., 42, 4 (2022), 1530-1536..

T. Kozawa, F. Kitabayashi, K. Fukuyama and M. Naito
Carbon Nanoparticle-Entrapped Macroporous Mn3O4 Microsphere Anodes with Improved Cycling Stability for Li-ion Batteries
Sci. Rep., 12 (2022), 11992.

A. Kondo, T. Kozawa, T. Ishii and M. Naito
Wet Milling Synthesis of Ammonium Cobalt Phosphate Hydrate Platelets for LCP-olivine Cathodes for LIB Using a Bead Mill
Int. J. Appl. Ceram. Technol., (2022), 1-8.

T. Kozawa, Y. Li and K. Hirahara
Formation Mechanism of Maze-Like Open Macropores in Mn_3O_4 Microspheres by Heating in Water Vapor and Their Single-Particle Compressive Behavior
Adv. Powder Technol., 33, 12 (2022), 103844.

T. Tasaka, T. Ohmura, A. Kondo and M. Naito
Effect of Heating Temperature on the Thermal and Mechanical Properties of Fibrous Fumed Silica Compacts
J. Soc. Powder Technol. Jpn., 59 (2022), 152-159 (in Japanese).

D. Tan, Z. Lao, W. Guo, A. Kondo, T. Kozawa, M. Naito, K. Plucknett and H. Lin
Fabrication and Modelling of Si_3N_4 Ceramics with Radial Grain Alignment Generated through Centripetal Sinter-Forging
J. Mater. Sci. Technol., 126 (2022), 1-14.

A. Kondo, T. Kozawa, T. Ishii, J. Kano and M. Naito
Mechanical Synthesis of Lithium Titanate Hydrate in Liquid Phase Using a Bead Mill
J. Soc. Powder Technol. Jpn., 59 (2022), 324-330 (in Japanese).

Y. Hayashi, Y. Kitamura, N. Abe, K. Ikeda, Y. Tatsumi and M. Tsukamoto
Surface Modification Technology Using Laser Metal Deposition and Its Applications
Review Laser Eng., 50, 9 (2022), 520-526 (in Japanese).

A. Kapil, T. Suga, M. Tanaka and A. Sharma
Towards Hybrid Laser-Arc Based Directed Energy Deposition: Understanding Bead Formation through Mathematical Modeling for Additive Manufacturing
J. Manufacturing Processes, 76 (2022), 457-474.

U. -K. Mohanty, A. Kapil, Y. Abe, T. Suga, M. Tanaka and A. Sharma
A Resource-Efficient Process Design for Heavy Fabrication: A Case of Single-Pass-Per-Layer Narrow Gap Welding
Sustain. Mater. Technol., 33 (2022), e00488.

[Materials, Metallurgy & Weldability]

S. Matsui, K. Ushioda and H. Fujii
Relationship between Cross Tension Strength and Carbon Content of Lower Sheet in Friction Element Welded Steel Joints
Quart. J. Japan Weld. Scity., 40, 1 (2022), 9-17 (in Japanese).

F. Spirrett, K. -C. Datsiou, M. Magallanes, I. Ashcroft and R. Goodridge
Powder-fed Directed Energy Deposition of Soda Lime Silica Glass on Glass Substrates
J. Am. Ceram. Soc., (2022), 1-14.

F. Spirrett, R. Goodridge, I. Ashcroft, K. Datsiou, C. Holcroft and S. Kirihara
Additive Manufacturing Processing of Glass Materials
J. Smart Process., 11, 4 (2022), 163-170 (in Japanese).

D. -L. Han, H. Tatsumi, F. Huo and H. Nishikawa
Effect of Isothermal Aging on Properties of In-48Sn and In-Sn-8Cu Alloys
Proc. 2022 IEEE 72nd Electronic Components and Technology Conf. (ECTC), (2022), 2148-2152.

S. Nitta, H. Tatsumi and H. Nishikawa
Preparation and Evaluation of Sn-In Alloys with Surface-Modified ZrO_2 Nanoparticles
Proc. 32nd Microelectronics Symp. (MES2022), (2022), 199-202 (in Japanese).

H. TATSUMI and H. NISHIKAWA
Anisotropic Highly Conductive Joints Utilizing Cu-Solder Microcomposite Structure for High-Temperature Electronics Packaging
Mater. Des., 223 (2022), 111204.

M. TAKAHASHI
Production of Glass-to-glass Anodically-bonded Interfaces in Which Conductive Areas and Insulating Areas Coexist
27th Symp. on "Microjoining and Assembly Technology in Electronics", (2022), 89-94 (in Japanese).

M. TAKAHASHI
Effect of Bonding Voltage on the Progress of Glass-to-glass Anodic Bonding Using a Conductor Layer as an Intermediary
28th Symp. on "Microjoining and Assembly Technology in Electronics", (2022), 120-125 (in Japanese).

S. FUKUMOTO, K. NAKAMURA, M. TAKAHASHI, Y. TANAKA, S. TAKAHASHI and M. MATSUSHIMA
Low-Temperature Bonding of Copper by Copper Electrodeposition
Mater. Trans., 63, 6 (2022), 783-788.

H. YAMAMOTO, S. KOGA, K. ITO and Y. MIKAMI
Fatigue Strength Improvement Due to Alloying Steel Weld Toes with WC Tool Constituent Elements through Friction Stir Processing
Int. J. Adv. Manuf. Technol., 119 (2022), 6203-3213.

M. IMAM, S. -N. -S. -H. CHITTAJALLU, H. GURURANI, H. YAMAMOTO, K. ITO, P. -K. PARCHURI, R. MISHRA, A. SHARMA, A. RICHHARIYA and V. CHINTHAPENT
Experimental Study on Improving the Additively Manufactured GMAW and TIG Beads Using FSP
Materials Today: Proc., 56 (2022), 690-705.

M. LIU, L. ZHANG, B. ZHAO, F. CHEN, X. XIA, Y. YU, H. YAMAMOTO and K. ITO
Orientation Dependence of Plastic Deformation of Sintered Nd-Fe-B Magnets at High Temperature
Acta Mater., 244 (2022), 118559.

T. KAWAKUBO, K. USHIODA and H. FUJII
Grain Boundary Segregation and Toughness of Friction-Stir-Welded High-Phosphorus Weathering Steel
Mater. Sci. Eng. A., 832 (2022), 142350.

T. OKADA, M. YASUYAMA, M. UCHIHARA and H. FUJII
Effect of Paint Baking Thermal Cycle on Joint Strength of Spot Welds
Weld. Int., 36, 2 (2022), 76-86.

T. NAGAI, H. MOROHASHI, Y. HANGAI, H. MITSUGI, Y. AOKI and H. FUJII
Foaming of Precursor of Porous Aluminum Consisting of Dissimilar Aluminum Alloys by Frictional Heating during Friction Stir Processing
Journal of Japan Institute of Light Metals, 72, 2 (2022), 54-57 (in Japanese).

J. -W. CHOI, Y. AOKI, K. USHIODA and H. FUJII
Effect of the Welding Parameters on Microstructure and Mechanical Properties of Linear Friction Welded Ti-6Al-4V Alloy
J. Manufacturing Processes, 75 (2022), 651-663.).

J. -W. CHOI, W. LI, K. USHIODA, M. YAMAMOTO and H. FUJII
Effect of Applied Pressure on Microstructure and Mechanical Properties of Linear Friction Welded AA1050-$H_2$4 and AA5052-H34 Joints
Sci. Technol. Weld. Joining, 27, 2 (2022), 92-102.

J. CHOI, W. LI, K. USHIODA, M. YAMAMOTO and H. FUJII
Microstructure Evolution and Hardness Distribution of Linear Friction Welded AA5052-H34 Joint and AA5083-O Joint
J. Mater. Res. Technol-JMRT, 17 (2022), 2419-2430.

W. ZEXI, K. USHIODA and H. FUJII
Suppression of Softening in Heat Affected Zone by Mo Addition in Friction Stir Welded Martensitic Steel
Sci. Technol. Weld. Joining, 27, 3 (2022), 204-212..

Z. ZENG, M. ZHOU, M. ESMAILY, Y. ZHU, S. CHOUDHARY, J. -C. GRIFFITH, J. MA, Y. HORA, Y. CHEN, A. GULLINO, Q. SHI, H. FUJII and N. BIRBILIS
Corrosion Resistant and High-Strength Dual-Phase Mg-Li-Al-Zn Alloy by Friction Stir Processing
Commun. Mater., 18 (2022), 1-10..

Y. HANGAI, K. OMIKA, M. INOUE, A. KITAMURA, H. MITSUGI, H. FUJII and Y. KAMAKOSHI
Effect of Porosity of Aluminum Foam on Welding between Aluminum Foam and Polycarbonate Plate during Friction Welding
Int. J. Adv. Manuf. Technol., 120 (2022), 1071-1078. s

Y. MATSUSHIMA, Y. HANGAI, H. MITSUGI and H. FUJII
Effects of Rotational Speed and Processing Time on Bonding Strength of Porous Aluminum and Thermoplastic Resin during Friction Welding
J. Japan Inst. Met. Mater, 86, 5 (2022), 71-76 (in Japanese).

T. YAMAMOTO, Y. HANGAI, H. MITSUGI, S. KOYAMA, R. SUZUKI, M. MATSUBARA and H. FUJII
Fabrication of Porous Aluminum Composites Containing Hollow Ceramics
J. Porous Mat., 29 (2022), 1363-1368.

A. MASUDA, Y. HANGAI, H. MITSUGI, R. SUZUKI, M. MATSUBARA and H. FUJII
Investigation of Separation of A1050 Aluminum and SS400 Steel Joined Body by Foaming
Journal of The Japan Institute of Light Metals, 72, 6 (2022), 366-370 (in Japanese).

Y. HANGAI, H. MOROHASHI, Y. AOKI, H. MITSUGI and H. FUJII
Process of Simultaneously Fabricating and Foaming Precursor Using Frictional Heat Generated during Friction Stir Welding
Int. J. Adv. Manuf. Technol., 121, 6 (2022), 3207-3214.

Y. WANG, S. TSUTSUMI, T. KAWAKUBO and H. FUJII
Fatigue Strength and Fracture Characteristics of Linear Friction Welded Joints of Weathering Mild Steel
Fatigue Fract. Eng. Mater. Struct., 45, 10 (2022), 2769-2783.

M. SALEH, H. LIU, K. USHIODA and H. FUJII
Effect of Zn Interlayer on Friction Stir Butt Welding of A1100 and SUS316L Stainless Steel
Sci. Technol. Weld. Joining, 27, 5 (2022), 361-373.

T. Nagira, T. NAKAMURA, F. YOSHINAKA, T. SAWAGUCHI, Y. AOKI, M. KAMAI, H. FUJII, A. TAKEUCHI and M. UESUGI
Direct Observation of Solidification Behaviors of Fe-Mn-Si Alloys during TIG Spot Welding Using Synchrotron X-ray
Scr. Mater., 216, 114743 (2022).

S. MATSUI, K. USHIODA and H. FUJII
Relationship between Cross Tension Strength and Carbon Content of Lower Sheet in Friction Element Welded Steel Joints
Weld. Int., 36, 8 (2022), 500-509.).

M. SIKJEONG, T. -M. PARK, D. -IIKIM, H. FUJII, H. -J. IM, P. CHOI, S. LEE and J. HAN
Improving Toughness of Medium-Mn Steels after Friction Stir Welding through Grain Morphology Tuning
J. Mater. Sci. Technol., 118 (2022), 243-254.

J. CHOIA, W. LI, K. USHIODA, M. YAMAMOTO and H. FUJII
Strengthening Mechanism of High-Pressure Linear Friction Welded AA7075-T6 Joint
Mater. Charact., 191, 112112 (2022).

S. MATSUI, K. USHIODA and H. FUJII
Effect of Ferrite Grain Shape in Friction Element Welds on Cross Tension Strength
Q. J. Jpn. Weld. Soc., 40, 3 (2022), 149-158.

T. OKADA, H. UEDA, K. MATSUDA, Y. MIYAZAKI, M. YASUYAMA and H. FUJII
Effect of Strength of Steel Sheets on Tensile Shear Strength and Failure Mode of Dissimilar Joint of Spot Welds
Q. J. Jpn. Weld. Soc., 40, 4 (2022), 216-225.

T. OKADA, H. UEDA, Y. MIYAZAKI, M. YASUYAMA and H. FUJII
Effect of Strength of Steel Sheets on Peel Tensile Strength and Failure Mode of Dissimilar Joint of Spot Welds
Q. J. Jpn. Weld. Soc., 40, 4 (2022), 226-237.

H. FUJII
FSW(Friction Stir Welding), LFW(Linear Friction Welding) and RW(Rotary Welding)
J. Light Metal Weld., 60, 10 (2022), 1-5 (in Japanese).

Z. WU, T. NAGIRA, K. USHIODA, G. MIYAMOTO and H. FUJII
Microstructures and Tensile Properties of Friction Stir Welded 0.2%C-2%Si-Cr Steels
J. Iron Steel Inst. Jpn., 108, 12 (2022), 911-925 (in Japanese).

T. KAWAKUBO, K. USHIODA, H. FUJII, T. KAMO and T. YOKOTA
Effects of Carbon and Phosphorus On Microstructure and Mechanical Properties of Friction Stir Welded Weathering Steels
J. Iron Steel Inst. Jpn., 108, 12 (2022), 926-936 (in Japanese)..

Y. AOKI, K. USHIODA and H. FUJII
Effect of Applied Pressure on Microstructure and Hardness of Linear Friction Welded Martensitic Steel
J. Iron Steel Inst. Jpn., 108, 12 (2022), 1011-1020 (in Japanese)..

Y. MIYANO, H. WASHIYA, H. SATO, Y. AOKI, M. KIMURA, K. USHIODA and H. FUJII
Friction Stir Welding of 1.4 GPa-grade Tempered Martensitic Steel
J. Iron Steel Inst. Jpn., 108, 12 (2022), 945-957 (in Japanese).

H. TSUCHIYA, K. HATSUDA, T. KAWAKUBO, K. USHIODA, H. FUJII, M. YAMASHITA and S. FUJIMOTO
Protectiveness of Rust Layers on Friction Stir Welded High Phosphorus Carbon Steels
J. Iron Steel Inst. Jpn., 108, 12 (2022), 937-944 (in Japanese).

A. SHARMA, Y. MORISADA and H. FUJII
Bending Induced Mechanical Exfoliation of Graphene Interlayers in a through Thickness Al-GNP Functionally Graded Composite Fabricated via Novel Single-Step FSP Approach
Carbon, 186 (2022), 475-491.

X. WANG, Y. MORISADA, K. USHIODA and H. FUJII
Double-sided Friction Stir Spot Welding of Ultra-High Strength C-Mn-Si Martensitic Steel by Adjustable Probes
J. Mater. Process. Technol., 300 (2022), 117422.

T. NAGAKOKA, H. HIRANO, Y. KIMOTO, T. TAKEUCHI, K. YAMADA, Y. MORISADA and H. FUJII
Effect of Silane Coupling Treatment on Friction Stir Welding of Pure Aluminum and CFRP
J. Light Metal Wel., 60, 4 (2022), 138-143 (in Japanese).

Y. LIM, Y. MORISADA and H. FUJII
Effect of Compression Rate on Microstructure and Mechanical Properties of Pressure-controlled Joule Heat Forge Welded AA5052-H34 Joint
J. Smart Process., 11, 3 (2022), 135-140 (in Japanese).

A. SHARMA, Y. MORISADA, T. NAGAOKA and H. FUJII
Enhanced Strength-Ductility Combination in the Cold-Rolled Spark Plasma Sintered Pure Aluminium by FSP
Mater. Charact., 188, 111914 (2022), 1-13.

A. SHARMA, Y. MORISADA, T. NAGAOKA and H. FUJII
Influence of the Number of FSP Passes on the Strength-Ductility Synergy of Cold-Rolled Spark Plasma Sintered Pure Aluminum
J. Manufacturing Processes, 79 (2022), 296-304.

Y. LIM, Y. MORISADA, H. LIU and H. FUJII
A Sound Dissimilar AA5052/S45C Joint Formed by Uniform and Simultaneous Deformation of Both Materials Using Pressure-controlled Joule Heat Forge Welding
ISIJ Int., 62, 8 (2022), 1715-1724.

N. KONDA, T. KITAMURA, M. MORI, Y. AOKI, Y. MORISADA and H. FUJII
Effect of Linear Friction Welding Conditions on Charpy Absorbed Energy for Mediumhigh Carbon Steel Plates
J. Iron Steel Inst. Jpn., 108, 12 (2022), 1002-1010 (in Japanese).

M. Mori, T. Ban, H. Takeuchi, Y. Morisada and H. Fujii
Friction Stir Welding of Thick Steel Plate Using Silicon Nitride Tool
J. Iron Steel Inst. Jpn., 108, 12 (2022), 958-965 (in Japanese).

M. Zhou, Z. Zeng, C. Cheng, Y. Morisada, Q. Shi, J. -Y. Wang and H. Fujii
Effect of the Processing Route on the Microstructure and Mechanical Behavior of Superlight Mg-9Li-1Zn Alloy via Friction Stir Processing
J. Magnes. Alloy., 10, 11 (2022), 3064-3081.

K. Funaki, Y. Morisada, T. Fukasawa, Y. Abe and H. Fujii
Effect of Silicon Nitride Microstructure on Characteristics of FSW Tool for Steel and Tool Life
Q. J. Jpn. Weld. Soc., 40, 4 (2022), 195-201 (in Japanese).

M. Koyama, T. Yamashita, S. Morooka, T. Sawaguchi, Z. yang, T. Hojo, T. Kawasaki and S. Harjo
Microstructure and Plasticity Evolution During Lüders Deformation in an Fe-5Mn-0.1C Medium-Mn Steel
ISIJ international, online (2022)..

M. Lee, T. Kawasaki, T. Yamashita, S. Harjo, Y. Hyun, Y. Jeong and T. Jun
In-situ Neutron Diffraction Study of Lattice Deformation Behavior of Commercially Pure Titanium at Cryogenic Temperature
Sci. Rep., 12 (2022), 3719.

N. Koga, T. Yamashita, K. Ogawa and O. Umezawa
Statistical Analysis of Influential Factors on the Stability of Retained Austenite in Low Alloy TRIP Steel
Mater. Trans., 63, 5 (2022), 693-702.

T. Yamashita, K. Ushioda and H. Fujii
Inhomogeneity of Microstructure along the Thickness Direction in Stir Zone of Friction Stir Welded Duplex Stainless Steel
Tetsu To Hagane-J. Iron Steel Inst. Jpn., 108, 12 (2022), 966-978 (in Japanese).

T. Miura, H. Fujii and K. Ushioda
Effects of Carbon Content and Austenite Grain Size on Retained Austenite Fraction in Stir Zone of Friction Stir Welded 6%Ni Carbon Steels
Tetsu-to-Hagane, 108, 6 (2022), 343-353 (in Japanese).

T. Miura, H. Fujii and K. Ushioda
Prediction of Material Flow Behavior in Stir Zones of Friction Stir Welded 6%Ni Carbon Steel Based on Texture Analysi
J. Japan Inst. Met. Mater. V, 86, 6 (2022), 87-96 (in Japanese).

T. Miura, H. Fujii and K. Ushioda
Effect of Welding Condition on Texture Evolution of Austenite in Stir Zone and Martensitic Transformation Behavior during Cooling in Ni-C
Tetsu To Hagane-J. Iron Steel Inst. Jpn., 108, 9 (2022), 631-641.

T. Miura, H. Fujii and K. Ushioda
Effects of Carbon Content and Austenite Grain Size on Retained Austenite Fraction in Stir Zone of Friction Stir Welded 6%Ni Carbon Steels
ISIJ Int., 62, 9 (2022), 1908-1917.

G. Ongtrakulkij, A. Khantachawana, J. Kajornchaiyakul and K. Kondoh
Effects of the Secondary Shot in the Double Shot Peening Process on the Residual Compressive Stress Distribution of Ti-6Al-4V
Heliyon, 8 (2022), e08758.

K. Kondoh, R. Takei, S. Kariya, S. Li and J. Umeda
Quantitative Analysis on Surface Potentials of Impurities and Intermetallic Compounds Dispersed in Mg Alloys Using Scanning Kelvin Probe Force Microscopy and Ultraviolet Photoelectron Spectroscopy
Mater. Chem. Phys., 279 (2022), 125760..

X. Guo, L. Jia, Z. Lu, Z. Xing, H. Xie and K. Kondoh
Preparation of Cu/CrB2 Composites with Wellbalanced Mechanical Properties and Electrical Conductivity by Ex-Situ Powder Metallurgy
J. Mater. Res. Technol-JMRT, 17 (2022), 1605-1615.

N. Suesawadwanid, A. Khantachawana, K. Srirussamee and K. Kondoh
Effect of Nb Content and Water Quenching on Microstructure and Mechanical Properties of Ti-Nb Alloys Fabricated by Spark Plasma Sintering
Powder Metall., (2022).

L. Cao, B. Chen, J. Wan, K. Kondoh, B. Guo, J. Shen and J. -S. Li
Superior High-Temperature Tensile Properties of Aluminum Matrix Composites Reinforced with Carbon Nanotubes
Carbon, 191 (2022), 403-414.

J. Wan, B. Chen, J. Shen, W. Shi, K. Kondoh, S. Li and J. -S. Li
Developing Dual-Textured Titanium (Ti) Extrudates via Utilizing the B Transus in Commercially Pure Ti
Mater. Des., 215 (2022), 110459.

R. Zheng, J. Cui, Y. Yang, S. Li, R. -D. -K. Misra, K. Kondoh, Q. Zhu, Y. Lu and X. Li
Enhanced Densification of Copper during Laser Powder Bed Fusion through Powder Surface Alloying
J. Mater. Process. Technol., 305 (2022), 117575.

K. Kondoh, R. Takei, S. Kariya, S. Li and J. Umeda
Local Galvanic Corrosion Analysis on Cast Mg-Ca Binary Alloy Using Scanning Kelvin Probe Force Microscopy
Mater. Lett., 319 (2022), 132266.

L. Zhang, C. Hu, Y. Yang, R. -D. -K. Misra, K. Kondoh and Y. Lu
Laser Powder Bed Fusion of Cemented Carbides by Developing a New Type of Co Coated WC Composite Powder
Addit. Manuf., 55 (2022), 102820.

K. -Y. Liu, J. -S. Li, J. Wan, Q. Yan, K. Kondoh, J. Shen, S. Li and B. Chen
Sintering-free Fabrication of High-Strength Titanium Matrix Composites Reinforced with Carbon Nanotubes
Carbon, 197 (2022), 412-424.

C. Zhang, L. Jia, H. Xie, R. Niu, Z. Lu and K. Kondoh
Simulation on the Direct Powder Rolling Process of Cu Powder by Drucker-Prager/Cap Model and Its Experimental Verification
Metals, 12 (2022), 1145.

A. Degnah, H. -F. Alnaser, E. -S. -M. Sherif, I. Alhoweml, K. Kondoh and A. Alhazaa
Investigation of Ti-Zr-Fe-N-H System Properties for Marine Applications
Mater. Today Commun., 32 (2022), 103978.

L. Jia, M. Hou, C. Zhanga, J. Xua, S. Lia, Z. Lua and K. Kondoh
Accelerated Diffusion Phenomenon of Ti-B_4C System and Its Influence on Resulted Composites
J. Mater. Eng. Perform., (2022).

K. Kondoh, A. Issariyapat, S. Kariya, S. Li, A. Alhazaa and J. Umeda
High Strength Ti-Zr Alloys With Balanced Ductility Fabricated By Powder Metallurgy And Additive Manufacturing Routes
Proc. World PM2022, (2022).

J. Cui, S. Li, R. -D. -K. Misra, K. Geng, K. Kondoh, G. Li and Y. Yang
Printability Enhancement and Mechanical Property Improvement via in Situ Synthesis of Carbon Nanotubes on Aluminium Powder
Powder Technol., 413 (2022), 118038.

K. Kondoh, S. Kariya, A. Issariyapat, S. Li and J. Umeda
Advanced Powder Metallurgy Process for High-strengthened Titanium Materials Using Ubiquitous Solid Solutes
Proc. JSME Int. Conf. on Materials and Processing 2022, (2022).

Y. Wang, L. Zhang, Y. Yang, K. Kondoh, L. Sun and Y. Lu
Elimination of H Phase in WC-Co Cemented Carbides during Laser Powder Bed Fusion by Powder Coating Compensation Strategy
J. Am. Ceram. Soc., 106, 3 (2022), 1681-1693.

R. YAO, K. CHEN, K. KONDOH, X. DONG, M. WANG, X. HUA and A. SHAN
Microstructure and Mechanical Properties of Friction Stir Lap Welds between FeCoCrNiMn High Entropy Alloy and 6061 Al Alloy
Mater. Des., 224 (2022), 111411.

X. ZHUO, H. YAO, K. CHEN, K. KONDOH, M. WANG, X. HUA and A. SHAN
Friction Stir Lap Welding of AZ31 and TC4: Mechanical Properties and Bonding Mechanism
Mater. Charact., 195 (2022), 112507.

Y. OZAKI, N. NOMURA, Y. SHIGETA, K. KONDOH, M. ARAMAKI and I. OBAYASHI
Additive Manufacturing Materials as Powder Metallurgy Materials, An Approach for Prediction of Mechanical Properties by Quantification of Microstructures
Bulletin Iron & Steel Inst. Japan, 27, 12 (2022), 825-835 (in Japanese).

G. ONGTRAKULKIJ, J. KAJORNCHAIYAKUL, K. KONDOH and A. KHANTACHAWANA
Investigation of Microstructure, Residual Stress, and Hardness of Ti-6Al-4V after Plasma Nitriding Process with Different Times and Temperatures
Coatings, 12, 12 (2022), 1932.

J. WAN, H. GENG, B. CHEN, J. SHEN, K. KONDOH and J. LI
Evading Ductility Deterioration in Aluminum Matrix Composites via Intragranulation of Nano-Reinforcement by Reactive Selective Laser Melting
Mater. Sci. Eng. A., 863 (2022), 144552.

K. SHITARA, K. YOKOTA, M. YOSHIYA, J. UMEDA and K. KONDOH
First-principles Design and Experimental Validation of B-Ti Alloys with High Solid-Solution Strengthening and Low Elasticities
Mater. Sci. Eng. A., 843 (2022), 143053.

Y. YANG, J. SHEN, J. UMEDA, K. KONDOH and Y. LI
Investigation into the Intermetallic Layers in Ti/Al Multi-Layer Composites Produced via Accumulative Rolling and Sintering
Sci. Adv. Mater., 14 (2022), 1-6.

W. SHI, Y. YANG, N. KANG, M. WANG, B. CHEN, Y. LI, J. UMEDA, K. KONDOH and J. SHEN
Microstructure and Mechanical Characterizations of Additively Manufactured High Oxygen-Doped Titanium
Mater. Charact., 189 (2022), 112008.

J. PETERSON, A. LSSARIYAPAT, J. UMEDA and K. KONDOH
The Effects of Heat Treatment and Carbon Content on the Mirostructure and Mechnical Properties of Laser Powder Bed Fision Ti-6Al-4V with Dissolved TiC Particles
J. Alloy. Compd, 920 (2022), 165930.

J. UMEDA, H. FUJII, R. TAKIZAWA, T. TERAMAE, A. ISSARIYAPAT, S. KARIYA, Y. YANG, S. LI and K. KONDOH
Tribological Behavior of Titanium-Sintered Composites with Ring-Shaped TiN Dispersoids
Lubricants, 10 (2022), 254.

J. UMEDA, H. MIYAJI, B. FUGETSU, S. -K. MOON, A. KHANTACHAWANA, S. KARIYA and K. KONDOH
Advanced Coating Process of Un-bundled Carbon Nanotubes on Titanium Plate to Improve Tribological Property and Biocompatibility
Proc. JSME Int. Conf. on Materials and Processing 2022, (2022).

S. KARIYA, A. ISSARIYAPAT, A. BAHADOR, J. UMEDA, J. SHEN and K. KONDOH
Ductility Improvement of High-Strength Ti-O Material upon Heteromicrostructure Formation
Mater. Sci. Eng. A., 842 (2022), 143041.

A. LSSARIYAPAT, S. KARIYA, K. SHITARA, J. UMEDA and K. KONDOH
Solute-induced Near-Isotropic Performance of Laser Powder Bed Fusion Manufactured Pure Titanium
Adiv. Manuf., 56 (2022), 102907.

A. BAHADOR, A. YURTSEVER, A. AMRIN, S. KARIYA, J. UMEDA, J. SHEN, B. CHEN, T. FUKUMA and K. KONDOH
Room Temperature and High-Temperature Properties of Extruded Ti-4Fe-3W/2TiC Composites in A+β and B Phases
Mater. Des., 220 (2022), 110901.

S. Kariya, A. Issaryapat, H. Umeda and K. Kondoh
Effect of Oxygen on Microstructure Formation on L-PBFed Ti Alloy
Bulletin Iron & Steel Inst. Japan, 27, 12 (2022), 906-912 (in Japanese).

P. Geng, M. Morimura, S. Wu, Y. Liu, Y. Ma, N. Ma, Y. Aoki, H. Fujii, H. Ma and G. Qin
Prediction of Residual Stresses within Dissimilar Al/steel Friction Stir Lap Welds Using an Eulerian-based Modeling Approach
J. Manufacturing Processes, 79 (2022), 340-355.

Y. Ogawa, T. Horita, N. Iwatani, K. Kadoi, D. Shiozawa and T. Sakagami
Evaluation of Fatigue Strength Based on Sissipated Energy for Laser Welds
Infrared Phys. Technol., 125 (2022), 104288.

M. Sakata, K. Kadoi and H. Inoue
Mechanism for Enhanced Age Hardening of 22 % Cr Duplex Stainless Steel Weld Metal Fabricated with Grade 2209 Filler Material
Mater. Today Commun., 33 (2022), 104201.

Y. Hou, Y. Nakamori, K. Kadoi, H. Inoue and H. Baba
Initiation Mechanism of Pitting Corrosion in Weld Heat Affected Zone of Duplex Stainless Steel
Corrosion Sci., 110278 (2022).

Y. Hou, G. Cheng, K. Kadoi and H. Inoue
Acceleration Mechanism of $Ti2O_3$ on TiN Formation and Δ-Ferrite Nucleation of Ferritic Stainless Steel
J. Alloy. Compd, 912 (2022), 165221.

Y. Hou, G. Cheng, K. Kadoi, H. Inoue, Q. Ruan, J. Pan and X. Chen
Formation Mechanism of Stripe Pattern Defect in Cold-Rolled AISI 441 Stainless Steel Stabilized by Ti and Nb
Metall. Mater. Trans. B, 53 (2022), 2499-2511.

W. Shen, G. Cheng, Y. Hou, Y. Li, X. Zhan, J. Liu and H. Zheng
Effects of the Cooling Rate and Recovery Temperature on the Growth of AlN Precipitates in Gear Steel
Steel Res. Int., 93, 10 (2022).

S. Kirihara
Development of Metal Structures by Stereolithographic Additive Manufacturing
J. Smart Process., 11, 4 (2022), 171-174 (in Japanese).

F. Spirrett, T. Ito and S. Kirihara
High-Speed Alumina Stereolithography
MDPI Appl. Sci., 12, 19 (2022), 9760.

M. Takahashi, F. Spirrett and S. Kirihara
Reduction of Dewaxing and Sintering Time by Controlling the Particle Size of YSZ Particles for Stereolithography
Ceramics, 5, 4 (2022), 814-820.

K. Fukushima, T. -S. Suzuki, C. -E. Özbilgin, K. Kobayashi, H. Abe and Y. Suzuki
PH-Controlled Synthesis and Spark Plasma Sintering of Fine and Homogeneous $MgZr_4(PO_4)_6$ Powder
J. Ceram. Soc. Jpn., 130, 2 (2022), 243-248.

T. Nakajima, H. Abe and Y. Suzuki
Effect of Transition Metal Oxides Addition on the Color Tone of $Bi_4V_2O_{11}$-based Red Pigments
J. Ceram. Soc. Jpn., 130, 2 (2022), 236-242.

F. Li, G. Zhang and H. Abe
Low-temperature Synthesis of High-Entropy $(Mg_{0.2}Co_{0.2}Ni_{0.2}Cu_{0.2}Zn_{0.2})O$ Nanoparticles via Polyol Process
Open Ceramics, 9 (2022), 100223.

Y. Inaba, K. Sato, N. Kannari, H. Abe, A. Sciazko and N. Shikazono
Growth of Strontium-doped Lanthanum Chromium Manganite/Gadolinium-doped Ceria(LSCM/GDC) Nanocomposite Particles as Ni-free Solid Oxide Fuel Cell Anode Material
J. Fuel Cell Technol., 22, 4 (2022), 86-90.

T. Naka, T. Nakane, J. Valenta, H. Mamiya, S. Ishii, M. Nakayama, H. Abe, T. Togashi and T. Uchikoshi
Slow Spin Dynamics in a CoM_2O_4 A-site Spinel (M=Al, Ga, and Rh)
J. Phys. Commun., 6, 5 (2022), 055001.

H. ABE, F. LI and K. SATO
Syntheses of Nano and Micro Particles for Direct-Writing
J. Smart Process., 11, 4 (2022), 148-152 (in Japanese).

C. -T. THANH, P. -N. -D. DUOC, N. -T. HUYEN, V. -T. THU, N. -X. NGHIA, N. -H. BINH, P. -V. TRINH, N. TU, C. ANH, V. TU, P. -N. MINH, H. ABE, E. -D. OBRAZTSOVA and N. -V. CHUC
Development of Electrochemical Sensor Based on Polyalanine/CuCl-Gr/DWCNTs for Highly Sensitive Detection of Glyphosate
Diam. Relat. Mat., 128 (2022), 109312.

T. HASHISHIN, H. ABE, M. MATSUDA, S. TSUREKAWA and H. KUBOTA
Synthesis of Functional Nanostructures in Solution, Nano-joining of Dissimilar Semiconductors for Environmental Sensing
Manuf. & Technol., 74, 4 (2022), 11-14 (in Japanese).

C. -T. THANH, P. -N. -D. DUOC, P. -V. TRINH, N. -T. HUYEN, N. -V. TU, C. -T. ANH, P. -V. HAI, K. YOSHIDA, H. ABE and N. -V. CHUC
3D Porous Graphene/double-Walled Carbon Nanotubes/gold Nanoparticles Hybrid Film for Modifying Electrochemical Electrode
Mater. Lett., 330 (2022), 133308.

F. LI, S. SUN, Y. CHEN, T. NAKA, T. HASHISHIN, J. MARUYAMA and H. ABE
Bottom-up Synthesis of 2D Layered High-Entropy Transition Metal Hydroxides
Nanoscale Adv., 4, 11 (2022), 2468-2478.

T. HASHISHIN, H. TANIGUCHI, F. LI and H. ABE
Useful High-Entropy Source on Spinel Oxides for Gas Detection
Sensors, 22, 11 (2022), 4233-4245.

F. LI, G. ZHANG and H. ABE
Sintering of High-Entropy Nanoparticles Obtained by Polyol Process: A Case Study of $(La_{0.2}Y_{0.2}Nd_{0.2}Sm_{0.2}Gd_{0.2})2Ce2O7\text{-}\delta$
J. Eur. Ceram. Soc., 42, 16 (2022), 7538-7545.

S. OHARA, T. NAKA and T. HASHISHIN
Ferromagnetism and Exchange Bias in Compressed Ilmenite–hematite Solid Solution as a Source of Planetary Magnetic Anomalies
Sci. Adv., 8, 14 (2022).

S. RAJA, M. -R. MUHAMAD, F. YUSOF, M. -F. JAMALUDIN, T. SUGA, H. LIU, Y. MORISADA and H. FUJII
Friction Stir Alloying of AZ61 and Mild Steel with Al-CNT Additive
Sci. Technol. Weld. Joining, 27, 7 (2022), 533-540.

M. -A. -B. ARIFFIN, M. -R. -B. MUHAMAD, S. RAJA, M. -F. JAMALUDIN, F. YUSOF, T. SUGA, H. LIU, Y. MORISADA and H. FUJII
Friction Stir Alloying of AZ61 and Mild Steel with Cu-CNT Additive
J. Mater. Res. Technol-JMRT, 21 (2022), 2400-2415.

A. SHARMA, Y. MORISADA and H. FUJII
Investigation of Through-Thickness Microstructural Evolution and Mechanical Properties Variation in Friction Stir Alloyed Al-Fe Alloy System
J. Alloy. Compd, 921 (2022), 166154.

A. SHARMA, Y. MORISADA and H. FUJII
Through-Thickness Localized Strain Distribution and Microstructural Characterization of Functionally Graded Al/GNP Composite Fabricated by Friction Stir Processing
Light Metals 2022, (2022), 274-282.

S. KIRIHARA
Additive Manufacturing in Biomedical Applications: Stereolithographic Additive Manufacturing of Biological Scaffolds (book)
Published by ASM, (2022).

[Mechanics, Strength & Structural Design]

H. CHEN, S. ZHAO, C. ZHANG, Z. SHI, F. GAO, Q. WANG, Z. SHEN and W. LI
Interfacial Reaction and Thermoelectric Properties of $Ca_3Co_4O_9$ Ceramic Diffusion Bonding Joints with Different Electrode Intermediate Layers
Ceram. Int., 48, 6 (2022), 8540-8547.

M. KOYAMA, T. YAMASHITA, S. MOROOKA, Z. YANG, R. -S. VARANASI, T. HOJO, T. KAWASAKI and S. HARJO
Hierarchical Deformation Heterogeneity during Lüders Band Propagation in an Fe-5Mn-0.1C Medium Mn Steel Clarified through in Situ Scanning Electron Microscopy
ISIJ international, online (2022).

S. HARJO, W. GONG, T. KAWASAKI, S. MOROOKA and T. YAMASHITA
Revisit Deformation Behavior of Lath Martensite.
ISIJ international, online (2022).

K. TAKADA, S. NISHI, N. SHIMIZU and N. MA
Application of Isogeometric Analysis to Vehicle Body Structure
JSAE, 74, 4 (2022), 110-116 (in Japanese).

N. MA, P. GENG and Y. MA
Thermal-mechanical Simulation of Friction Assisted Solid-State Joining Processes
Plastos, 5, 51 (2022), 143-147 (in Japanese).

T. CHU, C. SHAO, Y. WANG, N. MA and F. LU
Crack Branching Behavior and Amorphous Film Formation Mechanism during SCC Expanding Test for Multi-Layers Weld Metal of NiCrMoV Steels
Mater. Des., 216, 110520 (2022), 1-11.

J. PARK, G. AN, N. MA and S. KIM
Effect of Transverse Restraint on Welding Residual Stress in V-groove Butt Welding
Metals, 12, 654 (2022), 1-19.

Y. LIU, Y. YU, P. WANG, H. FANG and N. MA
Analysis and Mitigation of the Bending Deformation in Girth-Welded Slender Pipes with Numerical Modelling and Experimental Measurement
J. Manufacturing Processes, 78 (2022), 278-287.

T. WU, Y. MA, H. XIA, T. NIENDORF and N. MA
Measurement and Simulation of Residual Stresses in Laser Welded CFRP/steel Lap Joints
Compos. Struct., 292, 115687 (2022), 1-15.

B. YANG, D. LIN, H. XIA, H. LI, P. WANG, J. JIAO, X. CHEN, C. TAN, L. LI, Q. WANG and N. MA
Welding Characterization Evolutions for Dual Spot Laser Welded-Brazed Al/steel Joint with Various Spot Configurations
J. Mater. Res. Technol-JMRT, 19 (2022), 697-708.

J. XIN, D. WU, C. SHEN, L. WANG, X. HUA, N. MA, S. TASHIRO and M. TANAKA
Multi-physical Modelling of Alloy Element Transportation in Wire Arc Additive Manufacturing of a Γ-TiAl Alloy
Int. J. Therm. Sci., 179, 107641 (2022), 1-8.

S. WU, N. MA, S. RASHED, Y. MATSUOKA, F. LU and K. MIYAMOTO
A Position-Adjustable Universal Backing Plate to Improve Geometric Accuracy in Incremental Sheet Forming
Int. J. Adv. Manuf. Technol., 121, 8 (2022), 8143-8158.

W. HUANG, Q. WANG, N. MA and H. KITANO
Investigation of Residual Stress Distribution Pattern in Typical Wall and Pipe Components Built by Wire Arc Additive Manufacturing
J. Manufacturing Processes, 82 (2022), 434-447.

N. MA, Q. WANG, S. TOMITAKA, M. TAKAHASHI, K. MIMURA, K. HARA and X. LUO
Ultra-high Strain Rate Dependent Material Modeling and Experimental Observation for Study of Cold Spray Induced Extreme Plastic Deformation in Pure Nickel Particles
J. Jpn. Soc. Technol. Plasticity, 63, 740 (2022), 121-126 (in Japanese).

J. WANG, Y. CHEN, L. ZUO, H. ZHAO and N. MA
Evaluation of Thermal Fatigue Life and Crack Morphology in Brake Disc of Low Alloy Steel for High-Speed Trains
Materials, 6737 (2022), 1-15.

K. OKADA and N. MA
A Study of Fatigue Life and Weld Metal Toughness of LTT Elongated Bead
Prod. And Technol., 74, 4 (2022), 5-10 (in Japanese).

N. MA, K. HIRAOKA and H. MURAKAWA
LTT Elongated Bead Method for Fatigue Life Extension through Reduction of Stress Concentration and Generation of Compressive Welding Residual Stress
Prod. And Technol., 74, 4 (2022), 19-24 (in Japanese).

R. Akita, N. Ma and Y. Abe
Strength Evaluation of Adhesive and Clinching Joints of High Strength Steel and Aluminum Alloys
Weld. Technol., 2022, 9 (2022), 1-5 (in Japanese).

H. -B. Xia, L. Li, C. Tan, J. Yang, H. Li, W. Song, K. Zhang, Q. Wang and N. Ma
In Situ SEM Study on Tensile Fractured Behavior of Al/steel Laser Welding Brazing Interface
Mater. Des., 224, 111320 (2022), 1-11.

Z. Feng, N. Ma, K. Hiraoka, Y. Komizo, S. Kano and M. Nagami
Development of 16Cr8Ni Low Transformation Temperature Welding Material for Optimal Characteristics under Various Dilutions Due to All Repair Welding Positions
Sci. Technol. Weld. Joining, 2158282 (2022), 1-9.

S. Fujita, T. Kozaki and H. Serizawa
Galvanic Corrosion and Its Reliability Evaluation in Joining Dissimilar Materials
JSFM, 55, Special Issue (2022), 19-26 (in Japanese).

H. Serizawa
Study on Mechanical Properties of Advanced Multi-Material Dissimilar Lap Joint
Proc. IIW2022 - Int. Conf. on Welding and Joining, (2022), 567-570.

H. Ma, G. Qin, Q. Zhao and P. Geng
Correlation of Heterogeneous Interface Microstructure and Mechanical Performance of Inertia Friction Welded 6061 Al Alloy Joint
J. Mater. Res. Technol-JMRT, 17 (2022), 166-183.

H. Ma, G. Qin, P. Geng, Z. Ao and Y. Chen
Effect of Intermetallic Compounds on the Mechanical Property and Corrosion Behaviour of Aluminium Alloy/steel Hybrid Fusion-Brazed Welded Structure
J. Manufacturing Processes, 75 (2022), 170-180.

H. Ma, G. Qin, Z. Dang, S. Qu, L. Chen and P. Geng
Interfacial Microstructure Evolution and Mechanical Properties of Inertia Friction Welded Aluminium Alloy/stainless Steel Joint with Preheat Treatment
Mater. Sci. Eng. A., 836 (2022), 142671.

P. Geng, Y. Ma, N. Ma, H. Ma, Y. Aoki, H. Liu, H. Fujii and C. Chen
Effects of Rotation Tool-Induced Heat and Material Flow Behaviour on Friction Stir Lapped Al/steel Joint Formation and Resultant Microstructure
Int. J. Machine Tools and Manufacture, 174 (2022), 103858.

S. Wu, P. Geng, N. Ma and F. Lu
Contact-induced Vibration Tool in Incremental Sheet Forming for Formability Improvement of Aluminum Sheets
J. Mater. Res. Technol-JMRT, 17 (2022), 1363-1379.

P. Geng, M. Morimura, H. Ma, Y. Ma, N. Ma, H. Liu, Y. Aoki and H. Fujii
Elucidation of Intermetallic Compounds and Mechanical Properties of Dissimilar Friction Stir Lap Welded 5052 Al Alloy and DP590 Steel
J. Alloy. Compd, 906, 164381 (2022), 1-17.

Y. Ma, Y. Abe, P. Geng, R. Akita, N. Ma and K. Mori
Adhesive Dynamic Behavior in the Clinch-Bonding Process of Aluminum Alloy A5052-H34 and Advanced High-Strength Steel JSC780
J. Mater. Process. Technol., 305, 117602 (2022), 1-15.

H. Ma, Y. Zhao, G. Qin and P. Geng
Formation of Nanoscale Reaction Layer with Several Crystallinities in the Friction-Welded 6061 Al Alloy/steel Joint
Mater. Des., 219 (2022).

P. Geng, M. Morimura, N. Ma, W. Huang, W. Li, K. Narasaki, T. Ogura, Y. Aoki and H. Fujii
Measurement and Simulation of Thermal-Induced Residual Stresses within Friction Stir Lapped Al/steel Plate
J. Mater. Process. Technol., 310, 117760 (2022), 1-15.

R. Wu, P. Geng, M. Li, N. Ma and J. Chen
Interfacial Bonding Behaviours of AA5052/DC05 in Synchronous Thermomechanical Joining-Forming Process
J. Manufacturing Processes, 83 (2022), 787-798.

M. WANG, P. GENG, H. MA and G. QIN
Mechanical Property and Microstructure of IN718/FGH96 Dissimilar Superalloy Linear Friction Weldment
Int. Manufacturing Science and Engineering Conf., 85288 (2022).

H. MA, P. GENG and G. QIN
Effect of Alloying Elements of Al Alloy on the Interfacial Microstructure and Fracture Behaviour of Al Alloy/Steel Inertia Friction Welded Joint: A Comparative Study
Int. Manufacturing Science and Engineering Conf., 85196 (2022).

H. MA, P. GENG, G. QIN, C. ZHANG, J. ZHOU, W. HUANG and N. MA
Fine-Sized Multi-Principal Element Layer at the Weld Interface of Stainless Steel and Medium Entropy Alloy
Mater. Des., 223, 111255 (2022), 1-13.

H. KITANO and Y. MIKAMI
Constructing a Heat Source Parameter Estimation Model for Heat Conduction Finite Element Analysis Using Deep Convolutional Neural Network
Mater. Today Commun., 31 (2022), 103387.

T. OZAWA, T. KAWABATA and Y. MIKAMI
Proposal of New MOTE Methods for Brittle Fracture Toughness Determination
ISIJ Int., 62, 6 (2022).

T. OZAWA, T. KAWABATA and Y. MIKAMI
Quantitative Evaluation of Fracture Toughness Deterioration Due to Pre-strain
Eng. Fract. Mech., 272 (2022), 108683.

Y. SHINTAKU, F. NAKAMURA, S. TSUTSUMI and K. TERADA
An Implicit Solution for an Elastic-Plastic Model with Hardening Rule Depending on Plastic Strain Range Using a Primal-Dual Interior Point Method
Trans. Japan Soc. Comp. Eng. and Sci., 2022 (2022), 20220001 (in Japanese).

Y. WANG, S. TSUTSUMI, T. KAWAKUBO and H. FUJII
Effects of Phosphorus Content on Fatigue Performance of Friction Stir Welded Mild Steels
Constr. Build. Mater., 324 (2022), 126682.

H. SHIBATA, K. SATOH, H. HORIKAWA, K. HAMASAKI, L. BO and S. TSUTSUMI
Proposal of Modified Ens Method Considering Effective Stress Concentration Factor - Application to Butt Weld Joints with Backing Plate
J. Jpn. Soc. Civil Eng. Ser. A2, 72, 2 (2022), I_307-I_317 (in Japanese).

S. HAMADA, M. BEPPU, S. TSUTSUMI and H. ICHINO
A Study on the Perforation Failure of Steel Plates Subjected to a Flat - Nose Projectile Impact
J. Jpn. Soc. Civil Eng. Ser. A2, 72, 2 (2022), I_359-I_370 (in Japanese).

S. TSUTSUMI, R. FINCATO and A. BUERLIHAN
Numerical Study on Fatigue Notch Sensitivity of High and Middle Strength Carbon Steels for Weld Structures
J. Jpn. Soc. Civil Eng. Ser. A2, 72, 2 (2022), I_145-I_153.

Y. LUO, K. QIU, M. HE, R. MA, R. FINCATO and S. TSUTSUMI
Exploration of Fatigue Performance of Slotted CHS Tube-to-Gusset Plate Connection
Thin-Walled Struct., 173 (2022), 108920.

Y. SHINTAKU, S. TSUTSUMI and K. TERADA
A CDM-like Constitutive Law for Predicting Degradation of Strength and Ductility of Steel Subjected to Cyclic Loading
Int. J. Plast., (2022), 103237.

K. MORITA, M. MOURI, A. BUERLIHAN, F. RICCARDO and S. TSUTSUMI
Evaluation of Fatigue Crack Propagation Behavior in Low Carbon Steel and Their Simulated HAZ and Fatigue Life Assessment of Non-Load Carrying Welded Fillet Joint (Assessment of Fatigue Performance of Welded Joints Considering Cyclic Elasto-Plasticity Response)
Q. J. Jpn. Weld. Soc., 40, 1 (2022), 27-35 (in Japanese).

Y. WANG, S. TSUTSUMI, T. KAWAKUBO and H. FUJII
Microstructure, Mechanical Properties and Fatigue Behaviors of Linear Friction Welded Weathering Steels
Int. J. Fatigue, (2022), 106829.

N. OGUMA, A. NAKAGAWA, Y. NAKAMURA, S. TSUTSUMI and T. SAKAI
Construction of Probabilistic Model on Interior Crack Initiation and Growth Behaviors for High Strength Steels in Very High Cycle Fatigue
Trans. Japan Soc. Mech. Eng., (2022), 22-00021 (in Japanese).

Y. WANG, S. TSUTSUMI, T. KAWAKUBO and H. FUJII
Microstructure and Mechanical Properties of Friction Stir Welded High Phosphorus Weathering Steel
Sci. Technol. Weld. Joining, (2022), 2055290.

S. HAMADA, M. BEPPU, H. ICHINO and S. TSUTSUMI
A Study on the Evaluation Model for Perforation Failure of Steel Plates Subjected to the Impact by a Flat-Nose Projectile
J. Struct. Eng., 68A (2022), 907-919.

H. XIA, Y. MA, J. SU, C. TAN, L. LI and N. MA
Influence of Heat Input on the Laser Welded Steel/CFRP Lapped Joints
Compos. Struct., 2022 (2022), 1-13.

S H. XIA, Y. MA, C. CHEN, J. SU, C. ZHANG, C. TAN, L. LI, P. GENG and N. MA
Influence of Laser Welding Power on Steel/CFRP Lap Joint Fracture Behaviors
Compos. Struct., 285 (2022), 115247.

N. MA, D. DENG, N. OSAWA, S. RASHED, H. MURAKAWA and Y. UEDA
Welding Deformation and Residual Stress Prevention (book)
Published by Elsevier, (2022).

[General Welding]

M. TANAKA
Looking Back to 50 Years of JWRI, Osaka University and Its Future Prospects
J. Japan Welding Soc., 91, 3 (2022), 173-177 (in Japanese).

M. TANAKA
50th Anniversary of JWRI, Osaka University
TECHNO NET, 596 (2022), 12-14 (in Japanese).

K. TAKENAKA, M. HASHIDA, H. SAKAGAMI, S. MASUNO, M. KUSABA, S. YAMAGUCHI, S. IWAMORI, Y. SATO and M. TSUKAMOTO
Uniformity Evaluation of Laser-Induced Periodic Surface Structures Formed by Two-Color Double-Pulse Femtosecond Laser Irradiation
Rev. Sci. Instrum., 93, 9 (2022)

Joining and Welding Research Institute,
Osaka University, Japan

11-1 Mihogaoka, Ibaraki, Osaka 567-0047, Japan
Telephone +81-6(6877)5111
Facsimile +81-6(6879)8689
Web Site http://www.jwri.osaka-u.ac.jp/