材料プロセス工学 Materials Processing Engineering

鈴木　進補　Shinsuke SUZUKI

TEL：03-5286-8126　FAX：03-5286-8126
e-mail：suzuki-s@waseda.jp
URL：http://www.suzukilab.amech.waseda.ac.jp/

1993年 早稲田大学理工学部機械工学科卒業、1998年 博士（工学）（早稲田大学）、1998～2005 Technische Universität Berlin, Hahn-Meitner Institut Berlin 研究員、1999～2000 Alexander von Humboldt財団 奨学研究員、2005～2010 大阪大学産業科学研究所助教授（准教授）、2010～2013 早稲田大学高等研究所 准教授、2013～ 同大基幹理工学部 教授、2017～ 同大各務記念材料技術研究所 流動研究員

B. S. (1993, Waseda Univ.), M. S. (1995, Waseda Univ.), Dr. Eng. (1998, Waseda Univ.), Researcher (1998-2005, TU Berlin, Hahn-Meitner Institut Berlin), Research Fellow (1999-2000, Alexander von Humboldt Foundation), Associate Professor (2005-2010, Osaka Univ.), Associate Professor (2010-2013, Waseda Univ.), Professor (2013-present, Waseda Univ.)

金属の生産技術は、いつの時代においても社会的課題解決のキーテクノロジーとしての責任を担っています。本研究室は、ミクロ組織制御による機械的特性の向上を目的に、金属の溶解、凝固・鋳造、塑性加工を用いた材料プロセスの研究を行っています。

1）液体の物性測定（微小重力の利用）、2）金属用3Dプリンターにおける溶融凝固メカニズム解明と凝固組織制御、3）Ni基超合金のリサイクル技術、高温特性評価、合金開発、4）凝固法・半凝固法によるポーラス金属の製法開発、塑性加工による強化、機械的特性の評価、5）引抜き加工による高強度極細鋼線・極細管材の開発、6）高張力鋼板の成形性改善、7）金属材料における応力緩和特性の解明と塑性加工への適用

金属材料プロセスの研究は、長い歴史を持ちますが、本研究室では、世界をリードする研究機関と共同で、最新の実験・分析技術、数値解析、理論を駆使して、新たな学問領域を切り開いています。これらの研究活動を通じて、次世代のリーダーとなる人財を育成しています。

Manufacturing technologies of metallic materials always play the role of key technologies to solve the social issues. Our laboratory is researching material processing using melting, solidification, casting and plastic forming aiming at improvement of mechanical properties by controlling microstructures. The followings are our research topics.

1) Evaluation of physical properties of melt (utilization of microgravity), 2) Investigation of melting and solidification behavior and controlling microstructure during powder bed fusion of 3D printer for metallic materials, 3) Development of recycling method, evaluation of high-temperature properties and material design of Ni-base superalloy, 4) Development of fabrication method of porous metals through solidification and semi-solid processes, strengthening through plastic deformation, and their mechanical properties, 5) Development of high strength ultra-fine steel wires and fine metallic tubes by drawing, 6) Improvement of formability of high tensile steel sheets, and 7) Investigation of stress relaxation behavior of metallic materials and its application to plastic forming processes.

Although research on metallic material processing has a long history, our laboratory pioneers a new academic discipline using advanced experimental and analysis methods, numerical simulations and theories under collaboration with other leading research groups. Through these research activities, next generation leaders are growing up.

■代表論文および著書 /Representative publications

1) Shiinoki M., Hirata A., Suzuki S., “Molecular Dynamics Simulation of Diffusion Behavior in Liquid Sn and Pb”, Metall. Mater. Trans. B, online available, DOI: https://doi.org/10.1007/s11663-023-02957-4, (2023)
2) Tabata C., Osada T., Yokokawa T., Ikeda A., Kawagishi K., Suzuki S., “Effect of Solution Heat-Treatment on the Oxidation Resistance of Ni-Base Single-Crystal Superalloy”, Metall. Mater. Trans. B, 54, pp.4825-4833, (2023)
3) Hanada, C., Aoki, H., Ueda, Y., Kadoi, K., Mabuchi, Y., Yoneda, K., Yamada, M., Sato, H., Watanabe, Y., Harada, Y., Ozawa, S., Nakano, S., Koyama, C., Oda, H., Ishikawa, T., Watanabe, Y., Shimaoka, T., Suzuki, S., “Suppression of Bubble Formation in Levitated Molten Samples of Ti6Al4V with TiC for Hetero-3D at the International Station (ISS)”, Int. J. Microgravity Sci. Appl., 40, pp.400301:1-15, (2023)
4) Takamatsu, S., Arai, T., Sayama, A., Suzuki, S., “Characteristics of Pore Morphology in Aluminum Alloy Foams Fabricated by Semi-Solid Route among Multiple Experimental Runs”, Metals, 13, pp.1654:1-15, (2023)
5) Tabata, C., Kawagishi, K., Yokokawa, T., Uzuhashi, J., Ohkubo, T., Harada, H., Suzuki, S., “Effect of Ca Addition on the Oxidation Resistance of Ni-Al Alloy”, Metall. Mater. Trans. A, 54, pp.1937-1945, (2023)
6) Maezawa, H., Tabata, C., Takata, Y., Uzuhashi, J., Ohkubo, T., Yokokawa, T., Harada, H., Kawagishi, K., Suzuki, S., “Improvement of Oxidation Resistance for Ni-Base Single Crystal Superalloy TMS-238 by Suppression of Sb Segregation at Oxide/Substrate Interface Using CaO”, Metall. Mater. Trans. B, 55, pp.183-194, (2024)
7) Ichikawa, D., Sawada,,M., Suzuki, S., “The Compression Angle Dependence of the Strength of Porous Metals with Regularly Aligned Directional Pores”, Mater. Trans., 64, pp.2471-2480, (2023)
8) Sawada, M., Suzuki, S., “Prediction of Macroscopic Deformation Bands in Porous Metals with Unidirectional Through-Pores”, Adv. Eng. Mater., online available, online available, DOI: https://doi.org/10.1002/adem.202301001, (2023)
9) Ogura, T., Wakai, Y., Nakano, S., Sato, N., Kajino, S., Suzuki, S., “Transition mechanism of melt depth in vacuum during laser powder bed fusion using in-situ X-ray and thermal imaging”, Progress in Additive Manufacturing, online available, online available, DOI: https://doi.org/10.1007/s40964-023-00436-5, (2023)
10) Horie, T., Kawagishi, K., Takata, Y., Yokokawa, T., Suzuki, S., Harada, H., “Creep Durability of Ni-Base Single Crystal Superalloy Containing Pb Impurity”, Metall. Mater. Trans. A, 53, pp.2627-2641, (2022)
11) Tabata C., Kawagishi K., Uzuhashi J., Ohkubo T., Yokokawa T., Harada H., Suzuki S., ”Unveiling the Mechanism of Improved Oxidation Resistance for CaO Crucible Melting Using Ni-Al Alloy”, Metall. Mater. Trans. A, 53, pp.2452-2458, (2022)
12) Tominaga, K., Orikasa, I., Tomaru, M., Osada, T., Hashimoto, Y., Inatomi, Y., Suzuki, S., ”Diffusion coefficient analysis method using data statistical processing to reduce interference fringe noise effects”, AIChE Journal, 68, e17497, (2022)
13) Shiinoki, M., Yamada, N., Tanaka, A., Suzuki, S., ”Prediction of Temperature Dependence of Impurity Diffusion Coefficients in Liquid Metal Based on a Hard-Sphere Model from Measurements Using Shear Cell Technique and Stable Density Layering”, Metall. Mater. Trans. B, 53, pp.29-40, (2022)
14) Orikasa, I., Osada, T., Inatomi, Y., Ueno, I., Suzuki, S., ”Natural convection induced by unintended horizontal temperature distribution in a narrow-closed container heated from above”, Int. J. Heat Mass Transfer, 183, 122018, (2022)
15) Saito T., Harada H., Yokokawa T., Osawa M., Kawagishi K., Suzuki S., “Raft Structure of Nickel Base Single-Crystal Superalloys”, J. Jpn. Inst. Metals, 86, pp.157-171, (2022)
16) Murasawa K., Ueno K., Kusuda Y., Takamura M., Hama T., Hakoyama T., Suzuki S., “Prediction of the Stress Decreasing Behavior in the Early Stage of Stress Relaxation in Steel Sheet”, ISIJ Int., 62, pp.1004-1012, (2022)
17) Shiinoki M., Nishimura Y., Noboribayashi K., Suzuki S., “Suppressing Natural Convection for Self-diffusion Measurement in Liquid Pb Using Shear Cell Technique by Stable Density Layering of Isotopic Concentration”, Metall. Mater. Trans. B, 52, pp.3846-3859, (2021)
18) Date N., Yamamoto S., Watanabe Y., Sato H., Nakano S., Sato N., Suzuki S., “Effects of Solidification Conditions on Grain Refinement Capacity of TiC in Directionally Solidified Ti6Al4V Alloy”, Metall. Mater. Trans., A, 52, pp.3609-3627, (2021)
19) Horie T., Kono T., Kishimoto Y., Kawagishi K., Suzuki S., Harada H.,”The Effect of CaO-MgO Mixture on Desulfurization of Molten Ni-Base Superalloy”, Metall. Mater. Trans., B, 52, pp.2687-2702, (2021)
20) Sawada M., Ichikawa D., Borovinšek M., Vesenjak M., Suzuki S., “A statistical approach to evaluate the influence of geometric parameters on fracture of the cell walls in porous aluminum alloy”, Mater. Today Commun., 27, 102319, (2021)
21) Kishimoto Y., Kono T., Horie T., Yokokawa T., Osawa M., Kawagishi K., Suzuki S., Harada H., “Temperature Dependence of CaO Desulfurization Mechanism in Molten Ni-Base Superalloy”, Metall. Mater. Trans., B, 52, pp.1450-1462, (2021)