

## Department of Applied Chemistry

### Research Area : Inorganic Materials Laboratory

(URL: <http://achem.okayama-u.ac.jp/iml/>)

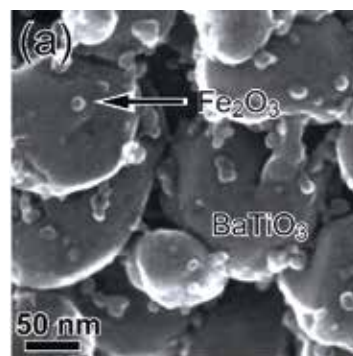
**Tatsuo FUJII, Professor**

**Jun KANO, Associate Professor**

**Makoto NAKANISHI, Assistant Professor**

#### Research Themes :

- 》 Characterization of Functional Ceramic Thin Films and Nano-particles
- 》 Developments of Advanced Magnetic Oxides by Soft Chemical Methods
- 》 Biogenous Iron Oxides for Novel Nanometric Materials
- 》 Design of New Catalysts Assisted by Ferroelectricity
- 》 Electronic Structure of Ferroelectrics



#### Representative Publication :

- T. Fujii, T. Numata, H. Nakahata, M. Nakanishi, J. Kano, N. Ikeda, Growth and charge ordering of epitaxial YbFe<sub>2</sub>O<sub>4</sub> films on sapphire using Fe<sub>3</sub>O<sub>4</sub> buffer layer, Jpn. J. Appl. Phys., vol. 57, 010305 (3p), 2018
- N. Oshime, J. Kano, N. Ikeda, T. Teranishi, T. Fujii, T. Ueda, T. Ohkubo, Quantitative study of band structure in BaTiO<sub>3</sub> particles with vacant ionic sites, J. Appl. Phys., vol. 120, 154101 (6p), 2016

### Research Area : Inorganic Solid State Chemistry Laboratory

(URL: )

**Akira KISHIMOTO, Professor**

**Hidetaka HAYASHI, Associate Professor**

**Takashi TERANISHI, Assistant Professor**

#### Research Themes:

- 》 High Performance Refractory Ceramics Utilizing Superplasticity
- 》 Enhanced Ion Transport under Millimeter-wave Irradiation
- 》 Composite Coating from Non-cloudy Electroplating Bath
- 》 Analysis of Broadband Frequency Response in Oxide Materials
- 》 Development of Battery with Ultrahigh Rate Capability Utilizing Dielectric Polarization

#### Representative Publication:

- Salmie S. C. Abdullah, T. Teranishi, H. Hayashi and A. Kishimoto, "Millimeter-wave irradiation heating for operation of doped CeO<sub>2</sub> electrolyte-supported single solid oxide fuel cell", J. Power Sources, Vol.374, pp.92-96, January 2018

### Research Area : Polymeric Materials Laboratory

(URL: <http://achem.okayama-u.ac.jp/polymer/index.html> )

**Tetsuya UCHIDA, Associate Professor**

**Takumi OKIHARA, Senior Assistant Professor**

#### Research Themes:

- 》 Nanomaterials of High-Performance Polymers
  - Creation of Super Materials by Novel Methodology for Morphology Control -
- 》 Development of a Retinal Prosthesis by Using Photoelectric Dye-Coupled Polyethylene Films (Okayama University-Type Retinal Prosthesis)
- 》 Functionalized Polysaccharide Material
- 》 Microwave Assisted Polymeric Material Processing
- 》 Biodegradable Polymeric Composite Material

## Representative Publication:

- Tomohiro Takahata, Takumi Okihara, Yasuhiro Yohida, Kumiko Yoshihara, Yasuyuki Shiozaki, Aki Yoshida, Kentaro Yamane, Noriyuki Watanabe, Masahide Yoshimura, Mariko Nakamura, Masao Irie, Bart Van Meerbeek, Masato Tanaka, Toshifumi Ozaki and Akihiro Matsukawa, "Bone Engineering by Phosphorylated-Pullulan and  $\beta$ -TCP Composite", *Biomedical Materials*, Vol. 10, No. 6, pp. 065009, November 2015.
- Tetsuya Uchida, Fumiaki Iwaguro, Risa Yanai and Haruka Dodo "Preparation of cellulose nanofibers coated with poly(vinyl alcohol) crystals and their application in composite films" *RSC Advances*, Vol.7, 19828-19832 (2017)

## Research Area : Fluid & Particle Process Engineering Laboratory

(URL: <http://achem.okayama-u.ac.jp/chemeng/index.html>)

**Kuniaki GOTOH, Professor**

**Koichi NAKASO, Associate Professor**

**Yasushi MINO, Assistant Professor**

### Research Themes:

- 》 Particle and Powder Characterization (Adhesion, Dustiness and Flowability)
- 》 Development and Improvement of Powder Unit Operations (Classification, Dispersion, Removal and Uniaxial Compression)
- 》 Heat and Mass Transfer in Powder Process
- 》 Effective Utilization of Energy (Chemical Thermal Energy Storage, Heat Transfer Enhancement)
- 》 Numerical simulations of colloid and powder dynamics (lattice Boltzmann method, discrete element method)

## Representative Publication:

- Kuniaki Gotoh, Kenta Mizutani, Yoshiaki Tsubota, Jun Oshitani, Mikio Yoshida and Ken Inenaga, "Enhancement of Particle Removal Performance of High-speed Air Jet by Setting Obstacle in Jet Flow," *Particulate Science and Technology*, 33, pp. 567-571, 2015.
- Koichi Nakaso, Yuuki Tanaka, Shotaro Eshima, Shunsuke Kobayashi, Jun Fukai, "Performance of a Novel Steam Generation System Using a Water-zeolite Pair for Effective Use of Waste Heat From the Iron and Steel Making Process," *ISIJ International*, 55(2), pp.448-456, 2015.
- Yasushi Mino, Shohei Sakai, Hiroyuki Shinto and Hideto Matsuyama, "Effect of internal mass in the lattice Boltzmann simulation of moving solid bodies by the smoothed-profile method," *Physical Review E*, 95, 043309, 2017.

## Research Area : Interface Process Engineering Laboratory

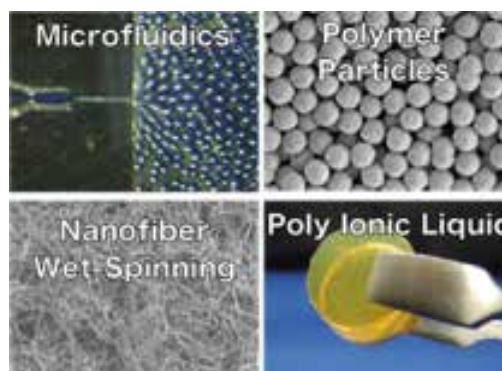
(URL: <http://achem.okayama-u.ac.jp/interface/en-home/>)

**Tsutomu ONO, Professor**

**Takaichi WATANABE, Assistant Professor**

### Research Themes:

- 》 Nanofiber Wet-Spinning
- 》 Polymeric Ionic Liquid and Ionic Liquid Interface
- 》 Microfluidics for Chemical Process
- 》 Polymer Particles and Capsules
- 》 Material Design for Drug Delivery



## Representative Publication:

- Takaichi Watanabe, Tsutomu Ono and Yukitaka Kimura, "Continuous Fabrication of Monodisperse Polylactide Microspheres by Droplet- to-Particle Technology Using Microfluidic Emulsification and Emulsion-Solvent Diffusion," *Soft Matter*, 7, pp. 9894-9897, August 2011.
- Takaichi Watanabe, Yui Sakamoto, Tetsuya Inooka, Yukitaka Kimura, Tsutomu Ono "Indocyanine green-laden poly(ethylene glycol)-block-poly(lactide) (PEG-b-PLA) nanocapsules incorporating reverse micelles: Effects of PEG-b-PLA composition on the nanocapsule diameter and encapsulation efficiency" *Colloids Surf., A: Physicochem. Eng. Asp.*, 520, pp. 764-770, May 2017.

## Research Area : Synthetic Process Chemistry Laboratory

(URL: <http://achem.okayama-u.ac.jp/reacteng/>)

**Seiji SUGA, Professor**

**Koichi MITSUDO, Associate Professor**

**Hiroki MANDAI, Assistant Professor**

### Research Themes:

- 》 Integrated Organic Synthesis
- 》 Organic Transformations Based on the Electron-Transfer Reaction
- 》 Synthetic Methods for Heteroacenes
- 》 Organocatalysts in Asymmetric Synthesis
- 》 Organic Synthesis Using Microreactor Technology

### Representative Publication:

- Hiroki Mandai, Kazuki Fujii, Hiroshi Yasuhara, Kenko Abe, Koichi Mitsudo, Toshinobu Korenaga and Seiji Suga, "Enantioselective Acyl Transfer Catalysis by a Combination of Common Catalytic Motifs and Electrostatic Interactions," *Nature Communications*, Vol.7, pp. 11297, April 2016.

## Research Area : Synthetic Organic Chemistry Laboratory

(URL: )

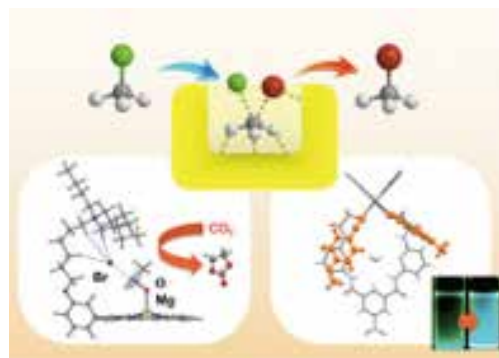
**Tadashi EMA, Professor**

**Kazuto TAKAISHI, Senior Assistant Professor**

**Chihiro MAEDA, Assistant Professor**

### Research Themes:

- 》 Synthesis of Functional Molecules Driven by Intermolecular Forces
- 》 Development of Catalysts Inspired by Catalytic Principles of Enzymes
- 》 Synthesis and Application of Functional Dyes Based on Porphyrins and Oligonaphthalenes
- 》 Chemical Fixation of CO<sub>2</sub>



### Representative Publication:

- Tadashi Ema, Yuki Miyazaki, Junta Shimonishi, Chihiro Maeda and Jun-ya Hasegawa, "Bifunctional Porphyrin Catalysts for the Synthesis of Cyclic Carbonates from Epoxides and CO<sub>2</sub>: Structural Optimization and Mechanistic Study," *Journal of the American Chemical Society*, Vol. 136, No. 43, pp. 15270-15279, September 2014.
- Chihiro Maeda, Tomoya Taniguchi, Kanae Ogawa and Tadashi Ema, "Bifunctional Catalysts Based on m-Phenylene-Bridged Porphyrin Dimer and Trimer Platforms: Synthesis of Cyclic Carbonates from Carbon Dioxide and Epoxides," *Angewandte Chemie International Edition*, Vol. 54, No. 1, pp. 134-138, January 2015.
- Kazuto Takaishi, Takahiro Yamamoto, Sakiko Hinoide and Tadashi Ema, "Helical Oligonaphthodioxepins Showing Intense CPL in Solution and in the Solid State." *Chemistry -An European Journal*, Vol. 23, No. 39, 9249-9252, June 2017.

## Research Area : Organometallic Chemistry Laboratory

(URL: <http://achem.okayama-u.ac.jp/omc/>)

**Kazuhiko TAKAI, Professor**

**Masahito MURAI, Assistant Professor**

**Sobi ASAKO, Assistant Professor**

### Research Themes:

- 》 Development of Novel Catalytic Processes for Green-Sustainable Chemistry
- 》 Invention of Highly Selective Synthetic Reactions with Novel Organometallic Species
- 》 Activation of Metals and Control of Electron Transfer Process from Low-Valent Metals to Organic Compounds
- 》 Creation of Novel Organometallic Reactive Species and Their Structure Determination



## Representative Publication:

- Masahito Murai, Ryuji Taniguchi, Naoki Hosokawa, Yuusuke Nishida, Hiroko Mimachi, Toshiyuki Oshiki, and Kazuhiko Takai, "Structural Characterization and Unique Catalytic Performance of Silyl Group-Substituted Geminal Dichromiomethane Complexes Stabilized with a Diamine Ligand," *J. Am. Chem. Soc.* Vol. 139, No. 37, pp. 13184-13192, August 2017.
- Masahito Murai, Erika Uemura, Shunsuke Hori, and Kazuhiko Takai, "Rhenium-Catalyzed Construction of Polycyclic Hydrocarbon Frameworks by a Unique Cyclization of 1,*n*-Diyne Initiated by 1,1-Difunctionalization with Carbon Nucleophiles," *Angew. Chem. Int. Ed.*, Vol. 56, No. 21, pp. 5862-5866, April 2017.
- Sobi Asako, Takahisa Sakae, Masahito Murai, and Kazuhiko Takai, "Molybdenum-Catalyzed Stereospecific Deoxygenation of Epoxides to Alkenes," *Adv. Synth. Catal.* Vol. 358, No. 24, pp. 3966-3970, November 2016.

## Research Area : Heteroatom Chemistry Laboratory

(URL: )

**Manabu KUROBOSHI, Associate Professor**

### Research Themes:

- 》 Electrosynthesis and Application of Organic Reductants
- 》 Synthesis of Phosphazene Derivatives by Electrooxidation
- 》 C-C Bond Formation by Using Transition Metal Catalyst/Viologen System
- 》 Electrooxidation/Reduction of Organophosphorus Compounds
- 》 Photoreduction of Viologen

### Representative Publication:

- Hiromu Kawakubo, Manabu Kuroboshi, Tomotake Yano, Kazuma Kobayashi, Syogo Kamenoue, Tomomi Akagi and Hideo Tanaka, "Electroreduction of Triphenylphosphine Oxide to Triphenylphosphine in the Presence of Chlorotrimethylsilane," *Synthesis* **2011**, 24, 4091-4098.

## Research Area : Industrial Catalysis Laboratory

(URL: <http://www.cc.okayama-u.ac.jp/~oshiki/e/index.html> )

**Toshiyuki OSHIKI, Senior Assistant Professor**

### Research Themes:

- 》 New Tungsten Catalysts for the Ring Opening Metathesis Polymerization of Dicyclopentadiene
- 》 Hydration of Organonitriles by Ruthenium Complexes Using a Minimum Amount of Water

### Representative Publication:

- Makoto Muranaka, Isao Hyodo, Wataru Okumura and Toshiyuki Oshiki, "2-Diphenylphosphanyl-4-Pyridyl(dimethyl)Amine as an Effective Ligand for the Ruthenium(II) Complex Catalyzed Homogeneous Hydration of Nitriles Under Neutral Conditions," *Catalysis Today*, Vol. 164, pp. 552-555, April 2011.

## Research Area : Bioprocess Engineering Laboratory

(URL: )

**Koreyoshi IMAMURA, Professor**

**Naoyuki ISHIDA, Associate Professor**

**Hiroyuki IMANAKA, Assistant Professor**

### Research Themes:

- 》 Science and Engineering of Amorphous Sugar Matrix
- 》 Direct Measurement of Surface-Surface, Surface-Molecule, and Intermolecular Interactions in Liquid Phase
- 》 Applications of Controlled Protein Immobilization Methods to Biotechnology and Life Sciences
- 》 Functional Immobilization of Biomolecules on Solid Surfaces

### Representative Publication:

- Tomo Satoh, Fumihiro Hidaka, Kento Miyake, Natsumi Yoshiyama, Koji Takeda, Tsutashi Matsuura, Hiroyuki Imanaka, Naoyuki Ishida and Koreyoshi Imamura, "Surfactant-Free Solid Dispersion of Fat-Soluble Flavour in an Amorphous Sugar Matrix," *Food Chemistry*, Vol. 197, pp. 1136-1142, April 2016.

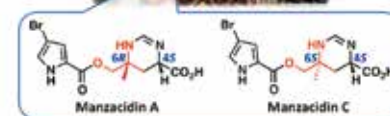
## Research Area : Bioorganic Chemistry Laboratory

(URL: <http://www.cc.okayama-u.ac.jp/~sakakura/>)

**Akira SAKAKURA, Professor**

**Ichiro HAYAKAWA, Associate Professor**

**Haruki MIZOGUCHI, Assistant Professor**



### Research Themes:

- 》 Total Synthesis of Bioactive Compounds
- 》 Design of Challenging Strategy for Organic Synthesis
- 》 Development of Highly Selective Carbon-Carbon Bond Formation Reactions
- 》 Rational Design of Chiral Acid-Base Cooperative Organocatalysts

### Representative Publication:

- Takayuki Kudoh, Yuya Araki, Natsumi Miyoshi, Mizuho Tanioka, Akira Sakakura, “Diastereodivergent Henry Reaction for the Stereoselective Construction of Nitrogen-Containing Tetrasubstituted Carbons: Application to Total Synthesis of Manzacidins A and C,” Asian Journal of Organic Chemistry, Vol. 6, No. 12, pp. 1760-1763, 2017.

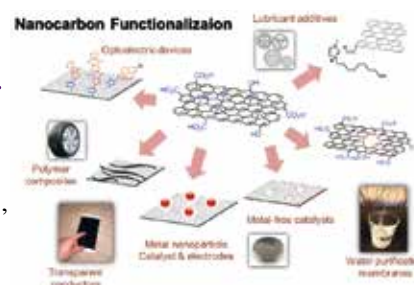
## Research Area : Functional Molecular Engineering Laboratory

(URL: <http://www.tt.vbl.okayama-u.ac.jp/>)

**Yuta NISHINA, Associate Professor**

### Research Themes:

- 》 Synthesis, Characterization and Application of Functional Nanocarbons
- 》 Application for Energy Devices: Li-ion Battery, Supercapacitor, Biofuel Cell, Fuel Cell
- 》 Application for Catalysts: Metal Nanoparticle Catalyst, Metal-free Catalyst
- 》 Application for Biology: Antibacterial Agent, Interaction with siRNA
- 》 Application for Environmental Industry: Water Purification, Biomass Transformation



### Representative Publication:

- Naoki Morimoto, Hideyuki Suzuki, Yasuo Takeuchi, Shogo Kawaguchi, Masahiro Kunisu, Christopher W. Bielawski, and Yuta Nishina, “Real-Time, in Situ Monitoring of the Oxidation of Graphite: Lessons Learned”, Chem. Mater. 2017, 29, 2150-2156.