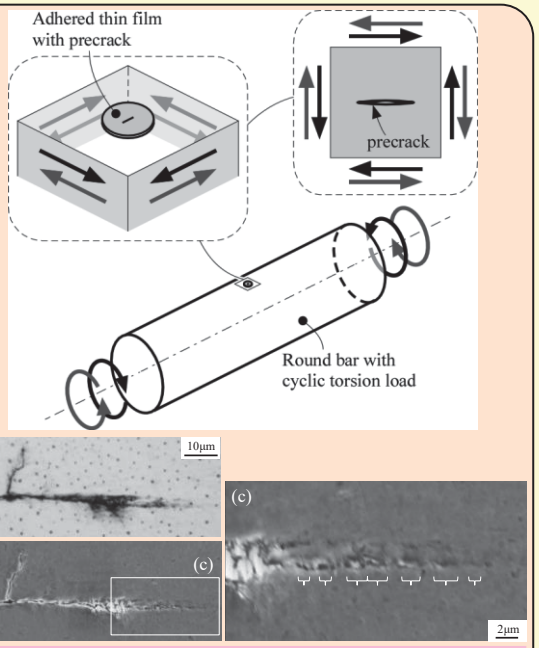
Solid Mechanics Lab.

– To seek machine safety and relief by making full use of multi-scale mechanics

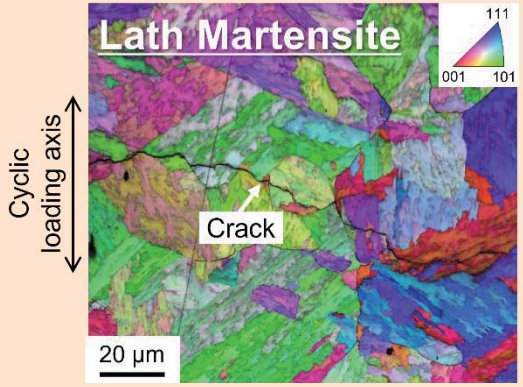
Prof. Shigeru Hamada, Assoc. Prof. Toshiyuki Kondo, Assist. Prof. Shohei Ueki

Research topics

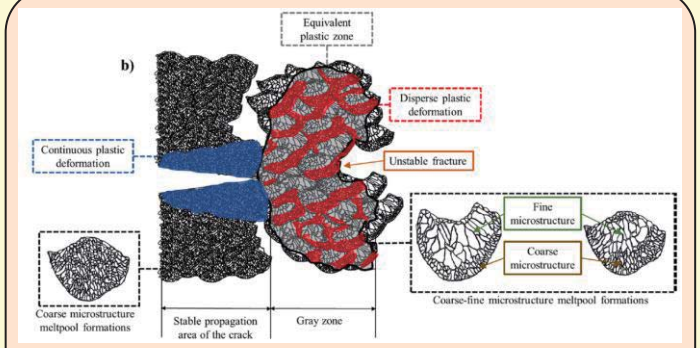
- Elucidation and establish a prediction method of damage accumulation mode fatigue crack propagation.
- Elucidation of failure mode transition mechanism in metal fatigue and its application to active control machine design.
- Elucidation of the fatigue crack propagation mechanism in high-strength steels with a complex martensite microstructure.
- Development of fatigue crack closure evaluation method for rational fatigue design of new materials.
- Elucidation of the size effects on fracture mechanisms and strength of metallic thin films
- Elucidation of the microscopic deformation and fracture processes of metallic thin films based on nano-observation and microstructural analysis



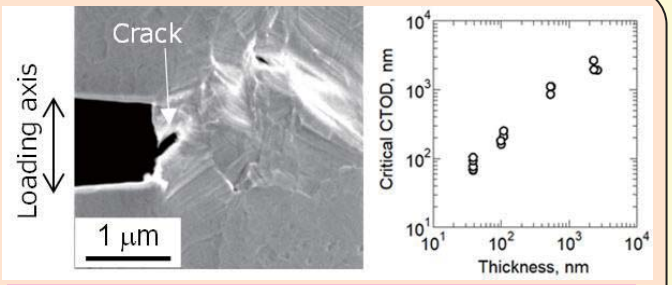
Damage accumulation mode fatigue crack propagation mechanism elucidation



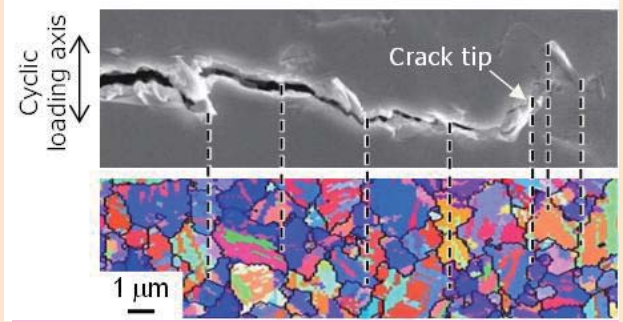
Analysis of fatigue crack propagation in high-strength steels



Exploring the fracture mechanism of 3D printer materials



Elucidation of the size effects on fracture strength of metallic thin films



Elucidation of the fracture process of metallic thin films

Structural Materials Lab.

— For the safety of structural materials —

Prof. H. Toda
Assoc. Prof. O. Takakuwa
Assist. Prof. H. Fujihara

Multiscale/Modal damage analysis

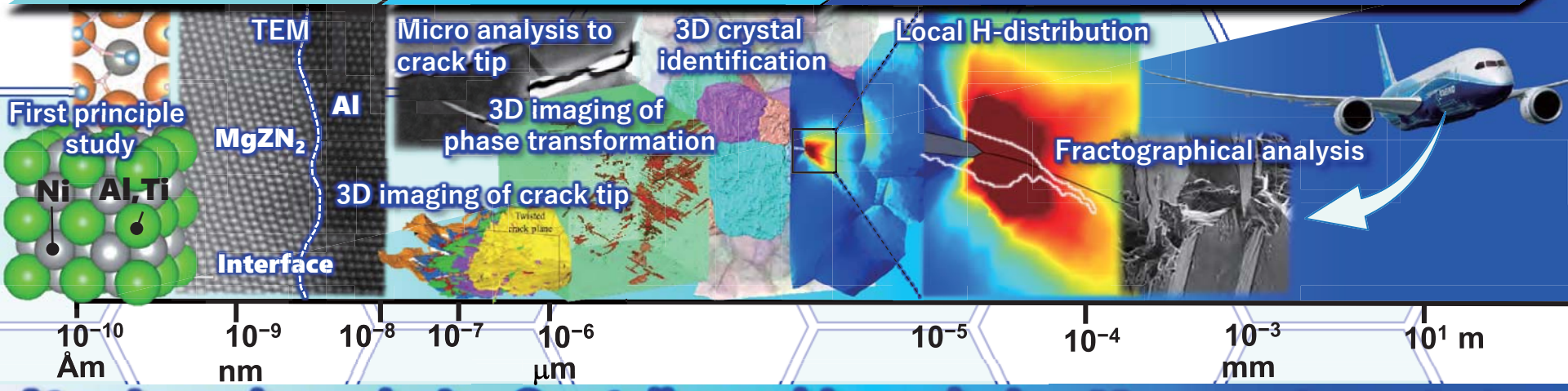
High resolution 3D/4D imaging

- Suppression of H-embrittlement in aluminum alloy for aircraft by Local H-partitioning
- Development of 3D/4D imaging for in-situ fracture behavior in high-strength steels
- 3D/4D imaging for strain-induced martensitic transformation with H-embrittlement
- Effect of alloying element on the H-solubility evaluated by atomic-scale calculations

Microscopic properties
- Nano particles
- Interface decohesion
- Deformation behavior
- Fracture behavior

Macroscopic properties
- Static strength
- Dynamic strength
- Ductility
- Fracture toughness

Nano-scale | **Micro-scale** | **Macro-scale**



Atomic scale analysis | **Crystallographic analysis** | **Macroscale analysis**

Mechanics for Material Design Lab.

Associate Prof. Yasuhiro KIMURA

Website URL

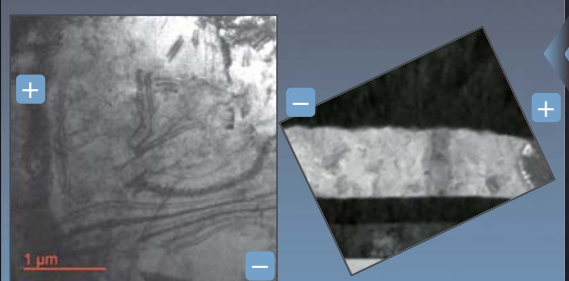
Policy We aim to develop "small manufacturing" technologies in the tiny scale.
Approach Experimental researches based on mechanics (also involves theory and numerical calculations)
Philosophy Understanding phenomena based on elementary processes and their technological development

Science

Why do atoms transport?
Elucidation of the mechanism of atom/dislocation motion

Interaction between Atoms & Electrons

Atoms & dislocations manipulation by electron flow



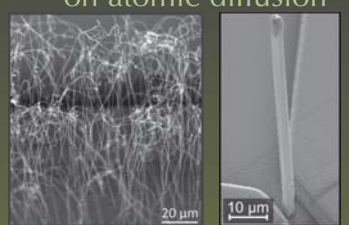
Examples of dislocation motion and microstructure change by in-situ TEM observation

Core tech.

Design of novel nanomaterials by controlling diffusion

Atomic Transportation & Metal Nanowire Growth

Nanomaterial fabrication based on atomic diffusion



Mass production **Precise production**

Study on atomic diffusion

Atomic transportation based on chemical potential gradient

Engineering

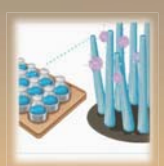
Nanomanufacturing development & creation of next-generation devices

Metal Nano-Architectonics

Toward materials found in everyday life

Metamaterial

Neurocomputing device



Biomarker

Space elevator tether

Flow control systems laboratory

Prof. Satoshi Watanabe
Associate Prof. Shin-ichi Tsuda
Assistant Prof. Taiki Takamine

Internal flow in fluid machinery and related fluid flow phenomena

Pumps and flow instability

- R&D of contra-rotating axial flow pump
- Cavitation instabilities of inducer
- Unsteady flow/fluid forces in multi-stage pump

Utilization of natural flow resources

- Savonius-type hydro-turbine for low head flow

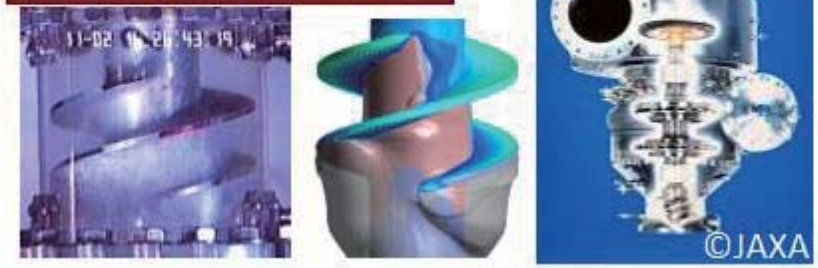
Cavitation

- Unsteady cavitation around hydrofoil/cascade
- Thermal effect of cavitation
- Cavitation in automotive torque converter

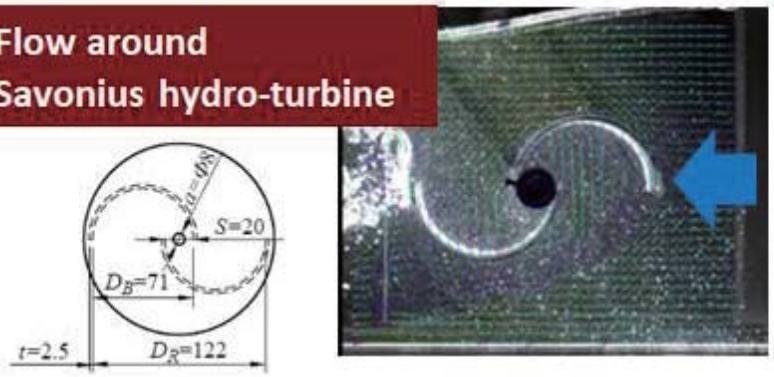
Liquid-vapor interface and bubbles

- Characteristics of evaporation/condensation process
- Bubble formation process in liquid rocket fuel

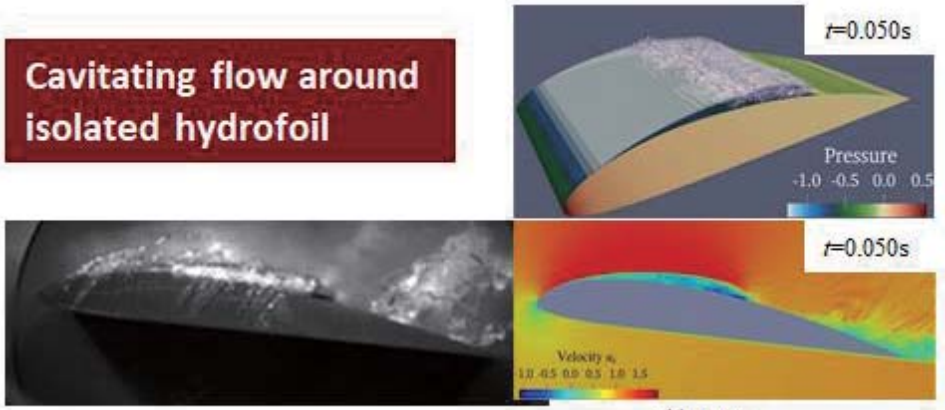
Cavitation surge in space rocket inducer



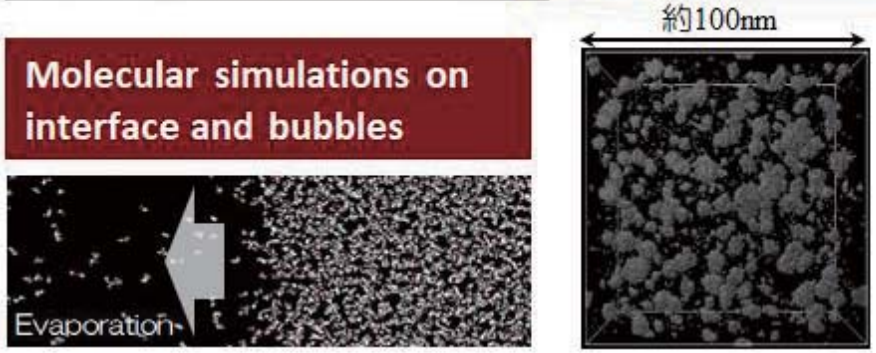
Flow around Savonius hydro-turbine



Cavitating flow around isolated hydrofoil



Molecular simulations on interface and bubbles



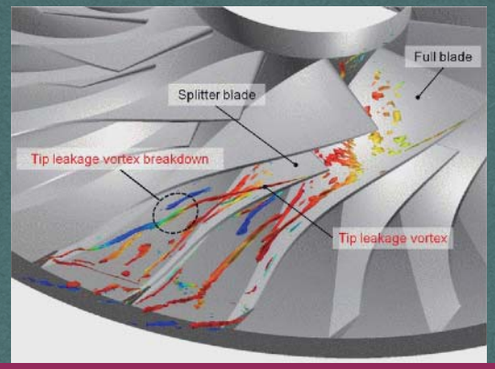
Fluids Engineering Design Lab.

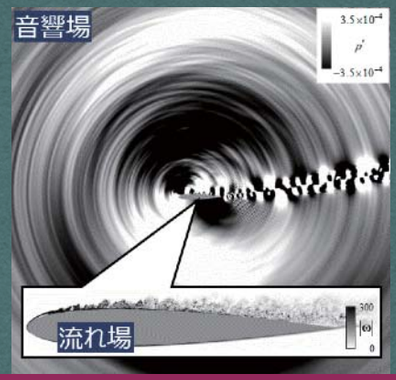
流体設計 研究室

Koji Shimoyama (Prof.)
Hideo Mori (Assoc. Prof.)

For creating innovative fluid machinery

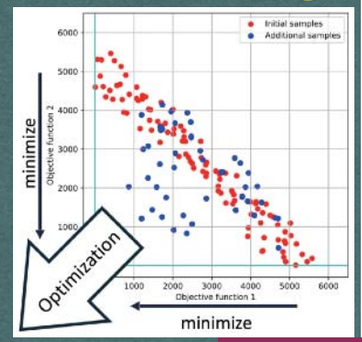
✓Clarify flow phenomena

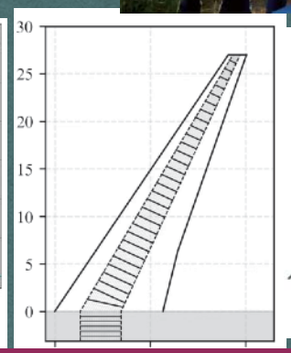


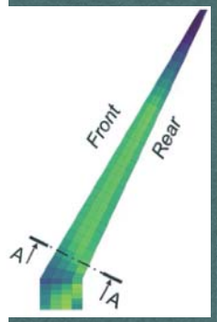


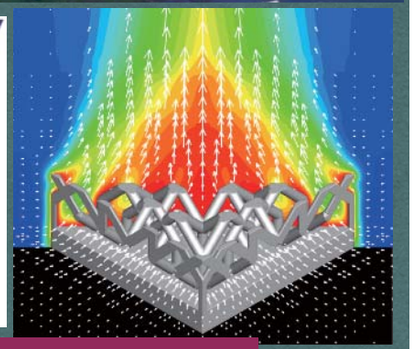
Numerical simulations (supercomputers)

✓Design fluid machinery

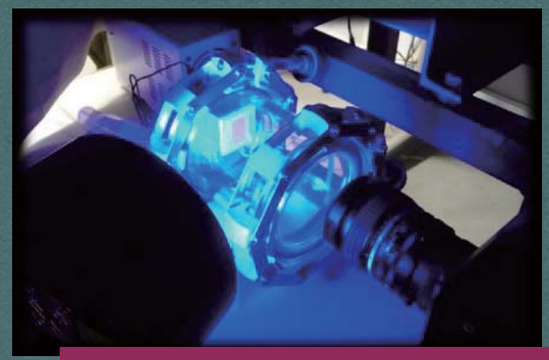


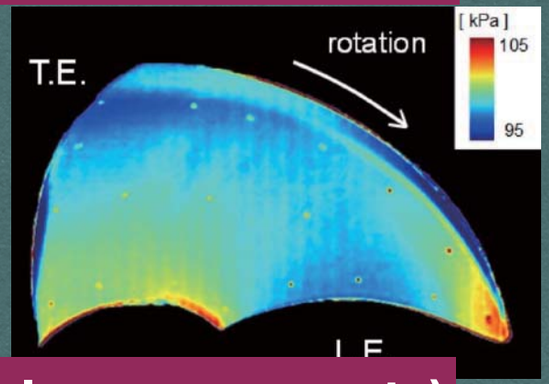




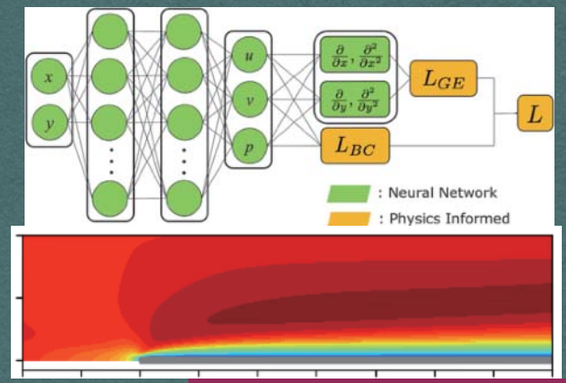


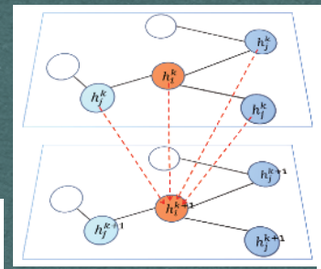
Optimization (mathematical science)

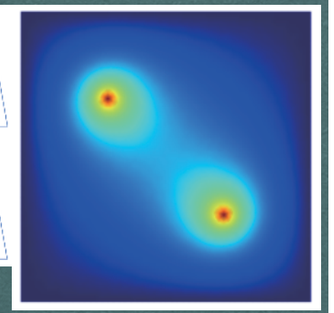




Experiments (optical measurements)







Artificial intelligence (data science)

Thermal Energy Conversion Lab.

Prof. Shoji MORI
Assoc. Prof. Yoshinori HAMAMOTO
Assist Prof. Yutaro UMEHARA

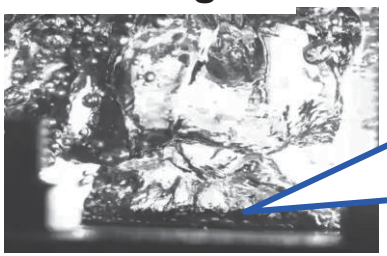
MISSION

Advance energy conversion efficiency for carbon neutral

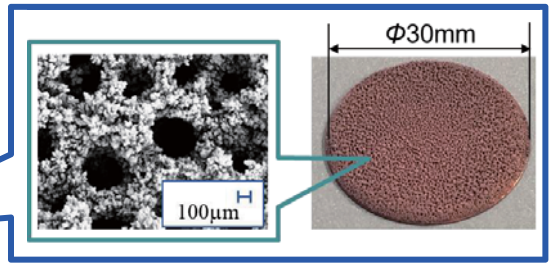
Thermal hydraulics

○Boiling heat transfer

<Boiling>

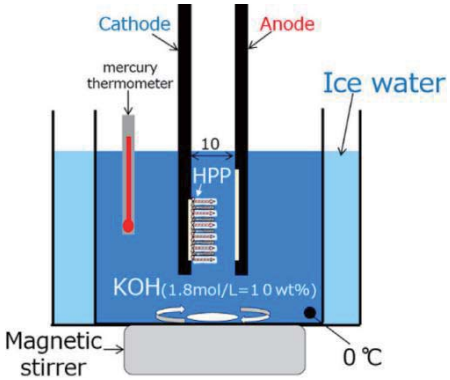


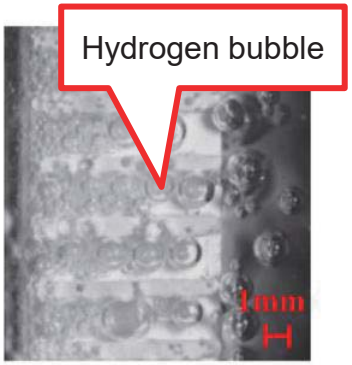
Micro porous



New energy system

○Hydrogen

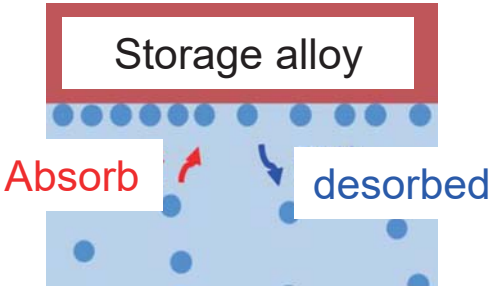




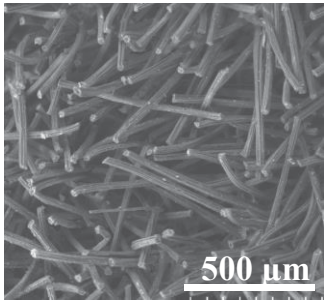
<High speed Image>

○Hydrogen storage alloy packed bed

- Expansion of hydrogen storage capacity per unit volume
- Increased reaction rate



○ Flocked heat transfer surface



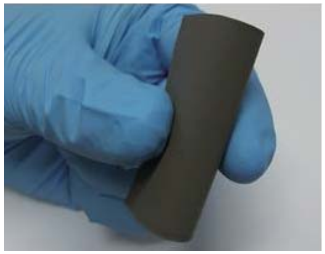
- Fiber flocked surface
- Formation of liquid film
- Promoting heat recovery

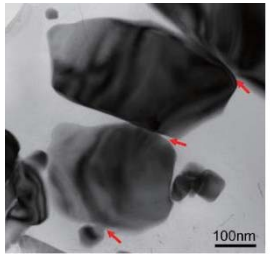
Thermofluid Physics Lab

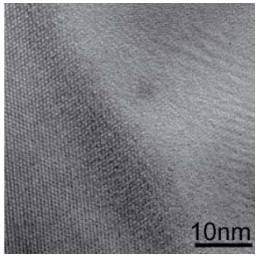
Prof. K. Miyazaki, Assist. Prof. K. Hashikuni

Development of thermal management beyond conventional limits through nanotechnology

Printed thermoelectric device development

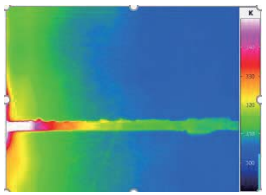


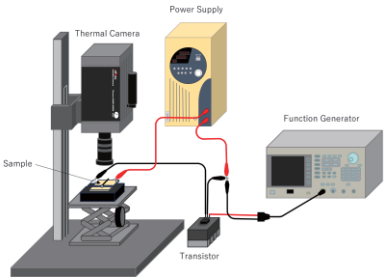




Low costs generator for Batteryless IoT

Non-contact measurements for Thermophysical properties





Thermal properties of small samples

Waveselective radiative properties control

Advanced radiative heat transfer control for efficient use of solar thermal energy

White hydrogen research

Olivine — Serpentine — Brucite — Magnetite

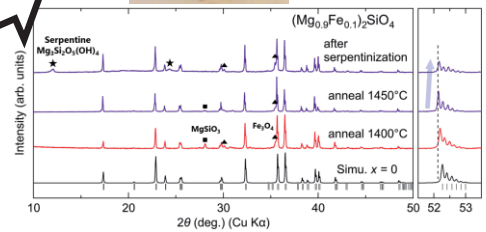
$$(Mg_{0.9}Fe_{0.1})_2SiO_4 + \frac{41}{30}H_2O \rightarrow \frac{1}{2}Mg_3Si_2O_5(OH)_4 + \frac{3}{10}Mg(OH)_2 + \frac{1}{15}Fe_3O_4 + \frac{1}{15}H_2$$

MgO

FeO

SiO_2

Artificial olivine

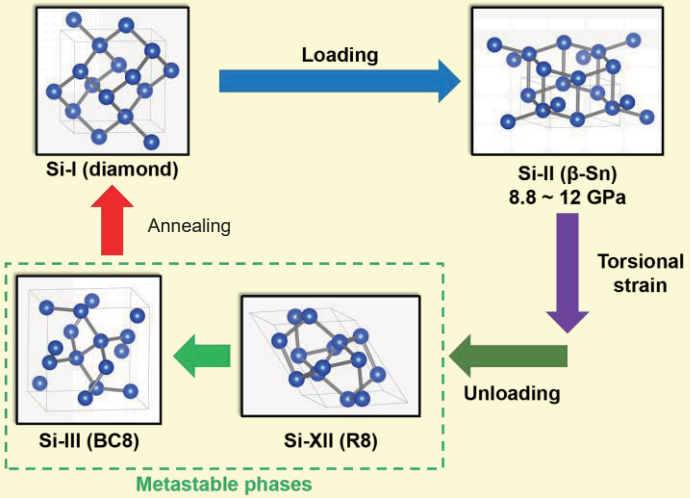


Thermal Physics & Engineering

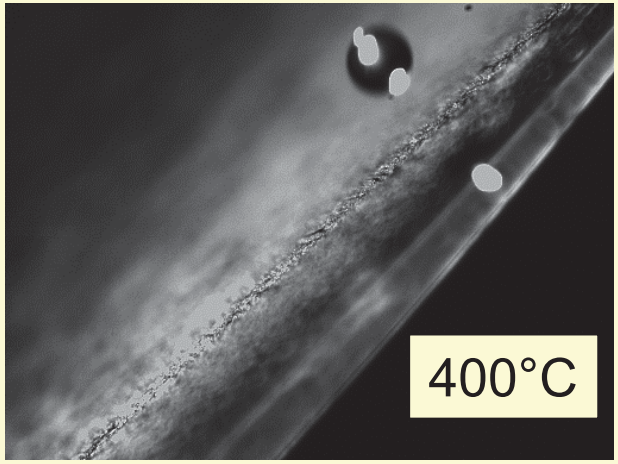
Professor
Masamichi KOHNO

Research Topics

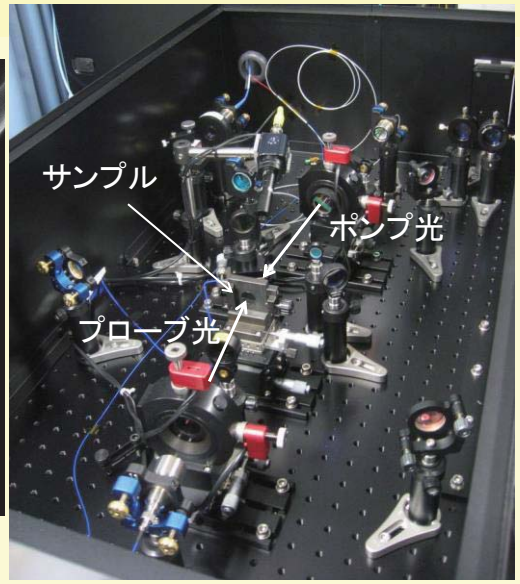
- Effect of high-pressure torsion on material's thermal transport properties
- Measurement of thermophysical properties of nano materials using laser beam techniques.
- Liquid-vapor phase change heat transfer (Spray cooling)
- Behavior and heat transfer of micro droplets impinging on high temperature solid surfaces



How thermal property changes according to its structure?



Micro droplets impinging on high temp. surfaces



Laser system for thermophysical property measurement

九州大学 大学院工学研究院 界面熱流体研究室

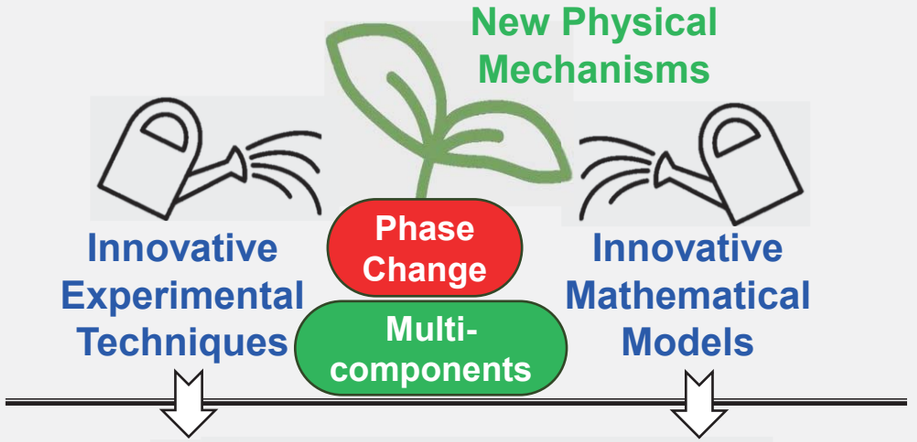
ThermoFluids & Interfaces Laboratory

Join TFI lab For Teamwork & Fun & Innovation

A new and expanding group! Everyone's gonna shine!

Fundamental Research

Predictable Wetting of Functional Liquids



- ✓ Novel visualization methods
- ✓ Image tracing and processing techniques
- ✓ Numerical approaches for complex boundary issues

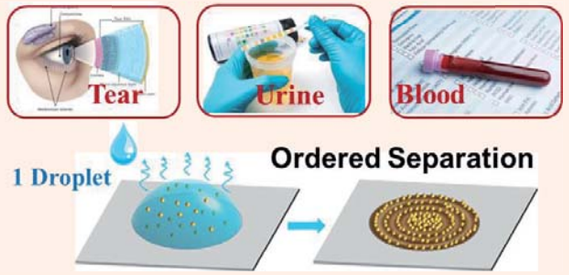
Technical Contributions to Broad Research in Interface Science

Application Technologies

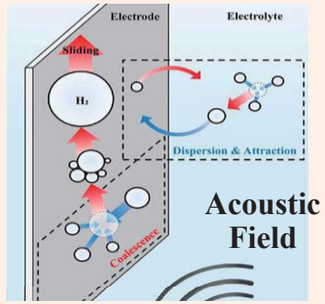
New MechE

Controllable Wetting of Functional Liquids

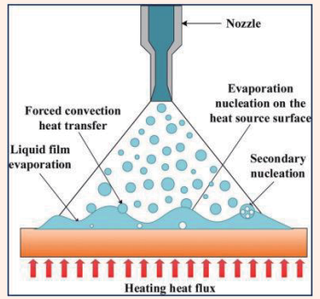
Advanced analysis based on one drop of samples



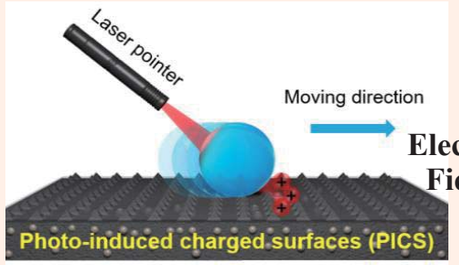
Water electrolysis with controllable bubble dynamics



High power density thermal cooling with binary refrigerants



Contactless modulation of chemical reactions



e.g., with external physical fields

Reshape the World with Thermofluids & Interfaces - for Future Oriented Medical Test, Advanced Cooling, and Energy Conversion -

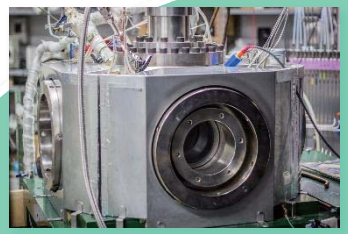
Reactive Gas Dynamics Lab.

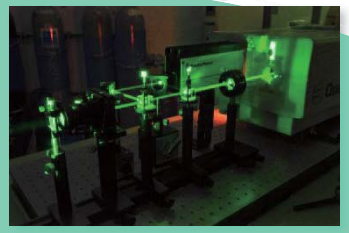
Assoc. Prof. E.C. Okafor
Assist. Prof. D. Matsuda

- Study of the science and technology of combustion

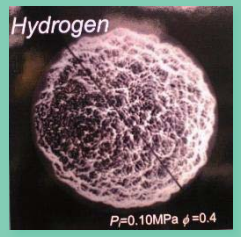
Our Goals	✧ Improvement of thermal efficiency (Energy saving) ✧ Environmental preservation (De-carbonization, Emissions control) ✧ Fuel diversification (Cost reduction, Energy security)
Our Targets	✧ Propulsive devices (Automobile engines, Supersonic aircraft engines, etc.) ✧ Stationary devices (Industrial gas turbines, etc.) ✧ Gas combustion, Liquid fuel (spray) combustion, Supersonic combustion, etc.
Our Themes	✧ Experimental and numerical studies of the physics and chemistry of combustion - including combustion of hydrogen, ammonia and E-Fuels from renewable energies, Engine combustion, PM(soot) formation, Supersonic combustion, Chemical kinetics, Spray characterization etc.

Experimental studies using advanced laser diagnostics

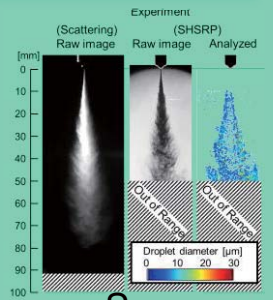




Laser visualization of a flame

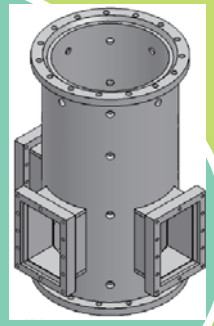


Exp on hydrogen combustion

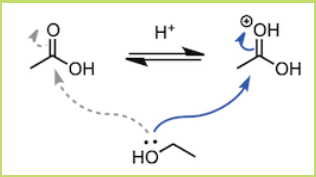


Spray characterization

Numerical studies using massive parallel computer

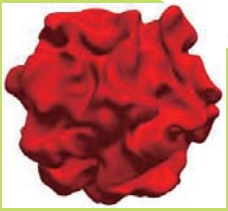


High pressure test chamber for burners

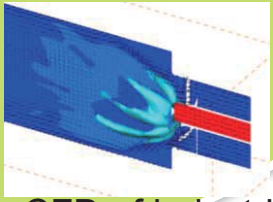


Chemical kinetics

CFD on engines



CFD on turbulent flame



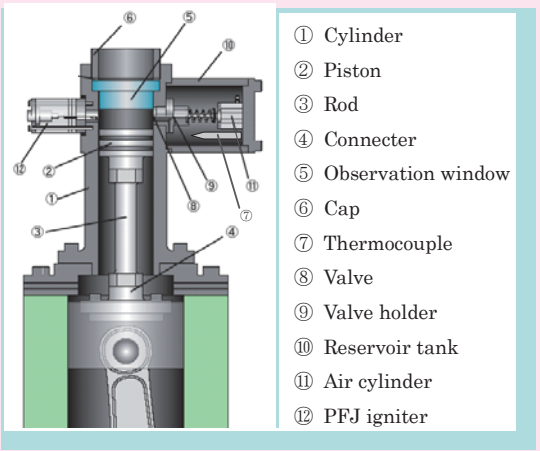
CFD of industrial burners for ammonia

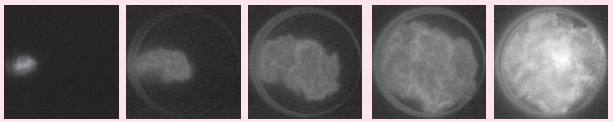
Engine Systems Lab.

Professor : Osamu MORIUE
Associate Professor : Shion ANDO

Research topics

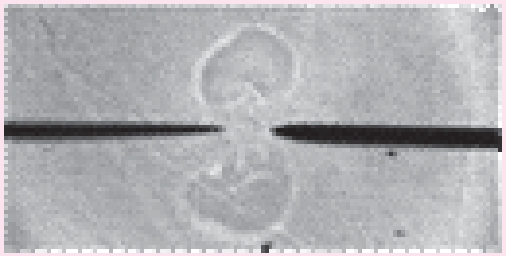
- Enhancement of ignition and burning rate of lean mixtures by Pulsed Flame Jet
- Ignition timing control of Homogeneous Charge Compression Ignition Combustion by Pulsed Flame Jet
- Study on vaporization, spontaneous ignition and combustion of fuel sprays
- Improvement of spark ignition of lean mixtures in a fast gas flow
- Numerical simulation of spray combustion
- Soot formation





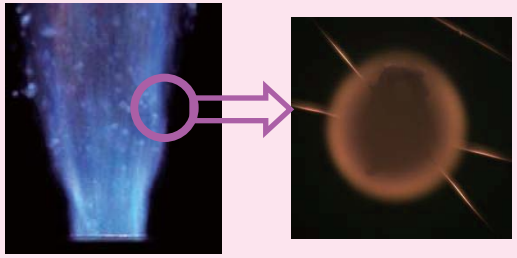
Ignition timing control of HCCI combustion by Pulsed Flame Jet

→ New concept of internal combustion engines



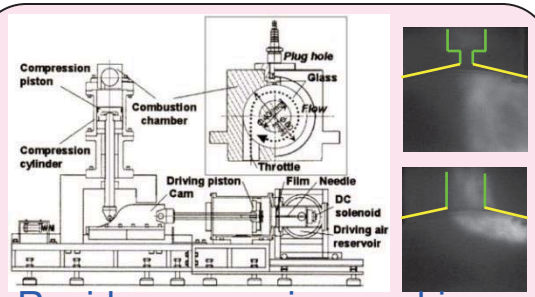
Premixed combustion

→ Gasoline engines



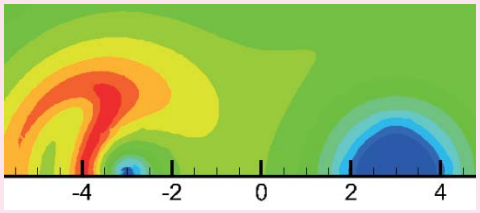
Spray combustion

→ Diesel engines
Gas turbine engines



Rapid compression machine

→ Improvement of spark ignition



Numerical simulation

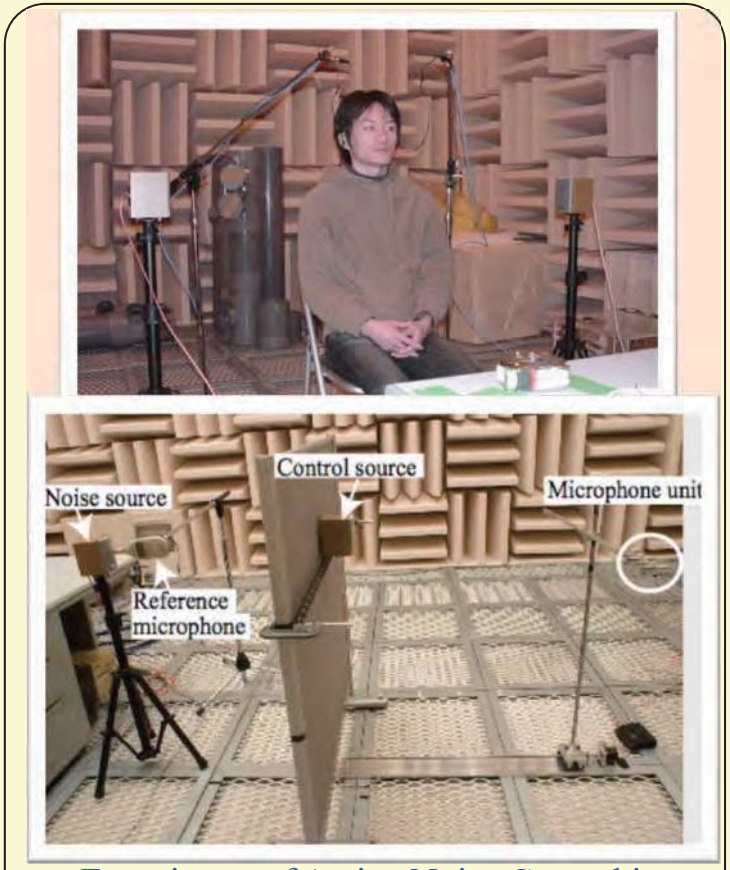
→ Detailed mechanism of combustion phenomena

Vibration and Acoustics Lab.

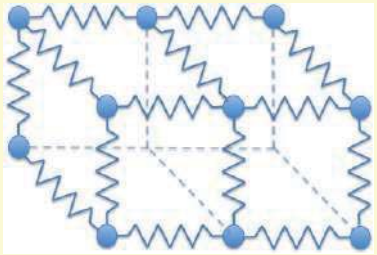
Prof. KIJIMOTO, Shinya
Assoc. Prof. ISHIKAWA, Satoshi

Research topics

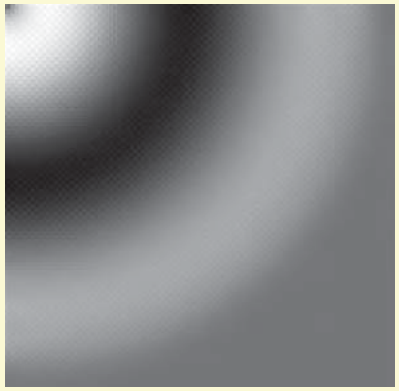
- Active noise control in 3-dimentional sound field.
- Large scale acoustic analysis using lumped mass model.
- Vibration damping.
- Evaluating and detecting softness of human body.



Experiment of Active Noise Control in anechoic chamber

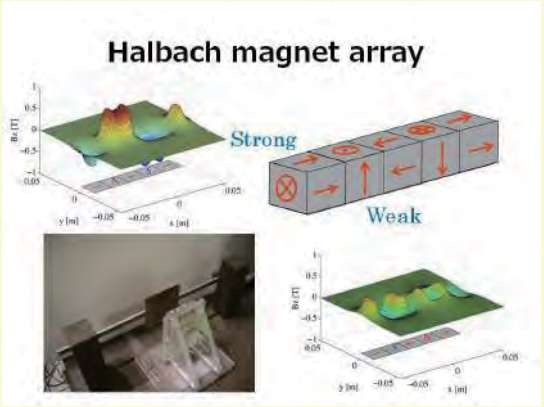


3-D lumped mass model



Sound pressure distribution (example of calculation result)

Softness sensor for human body

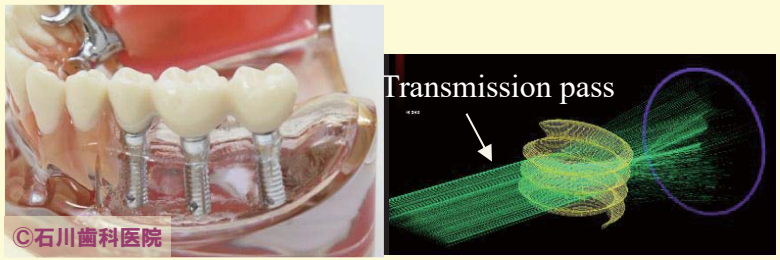


Magnetic damper

Dynamics of Machinery Lab.

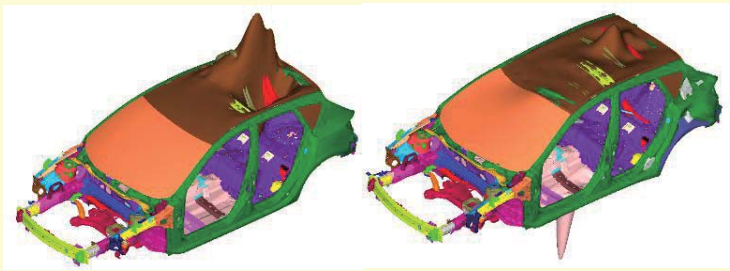
Prof. Takumi Inoue
Assoc. Prof. Hiroki Mori
Assist. Prof. Kai Kurihara

New diagnostic technique using ultrasound wave



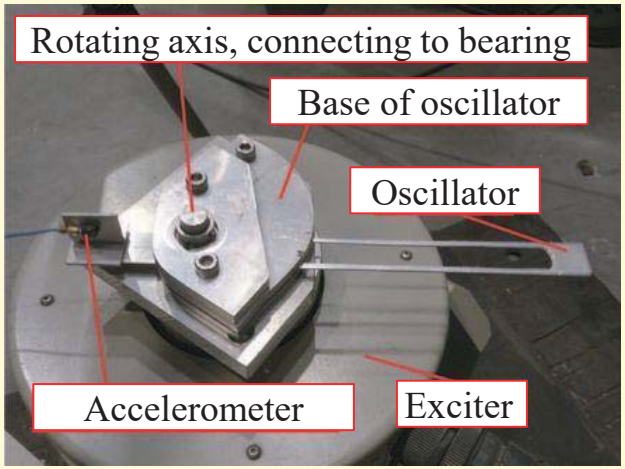
Evaluation of slackness using ultrasound pulse wave (Model and simulation)

Vibration analysis of automobile structure

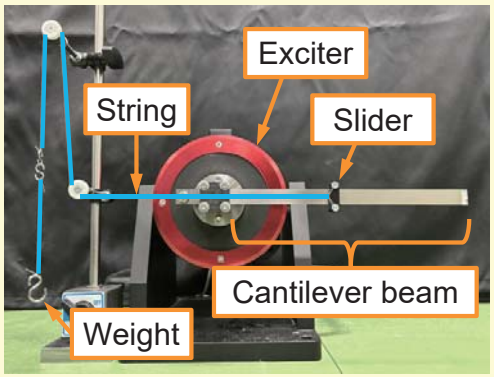


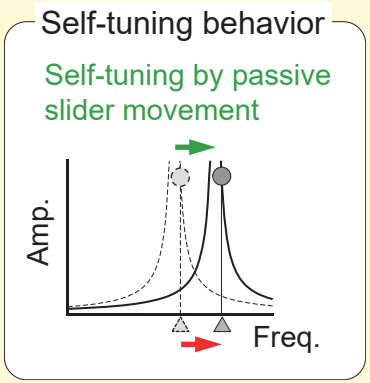
Study for efficient vibration analysis of automobile body structure

Mechanical automatic tuning resonator for vibration-powered generator



Novel mechanism for automatic tuning to resonance



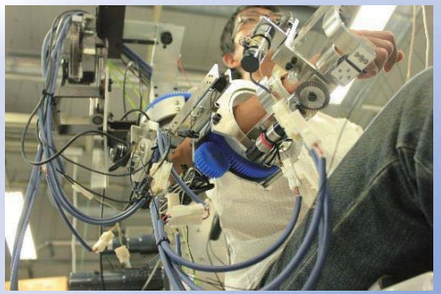


Test rig of beam-slider structure and self-tuning mechanism

System Engineering Laboratory

Prof. Kazuo KIGUCHI, Assoc. Prof. Satoshi NISHIKAWA, Assist. Prof. Yasutaka TSUJI

Care Robots

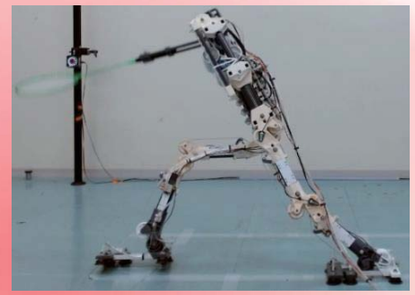


Power Assist

Perception Assist

Rehabilitation

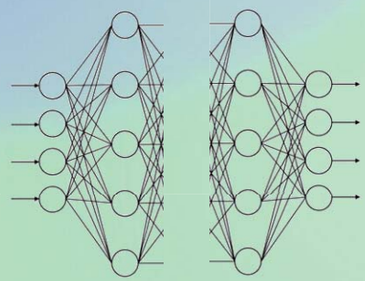
Sports Robots



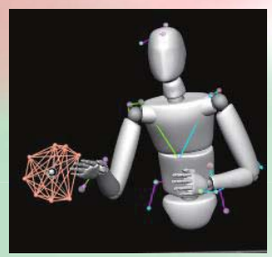
Acquirement of motor skills

Practice support

Kinesthetic illusion and motion change by vibration stimulation on the tendon



Motion intention estimation



Measurement and analysis of biosignals/motion

Investigation and exploitation of human characteristics

System Engineering Lab

Control Engineering Laboratory

Motoji Yamamoto Professor,

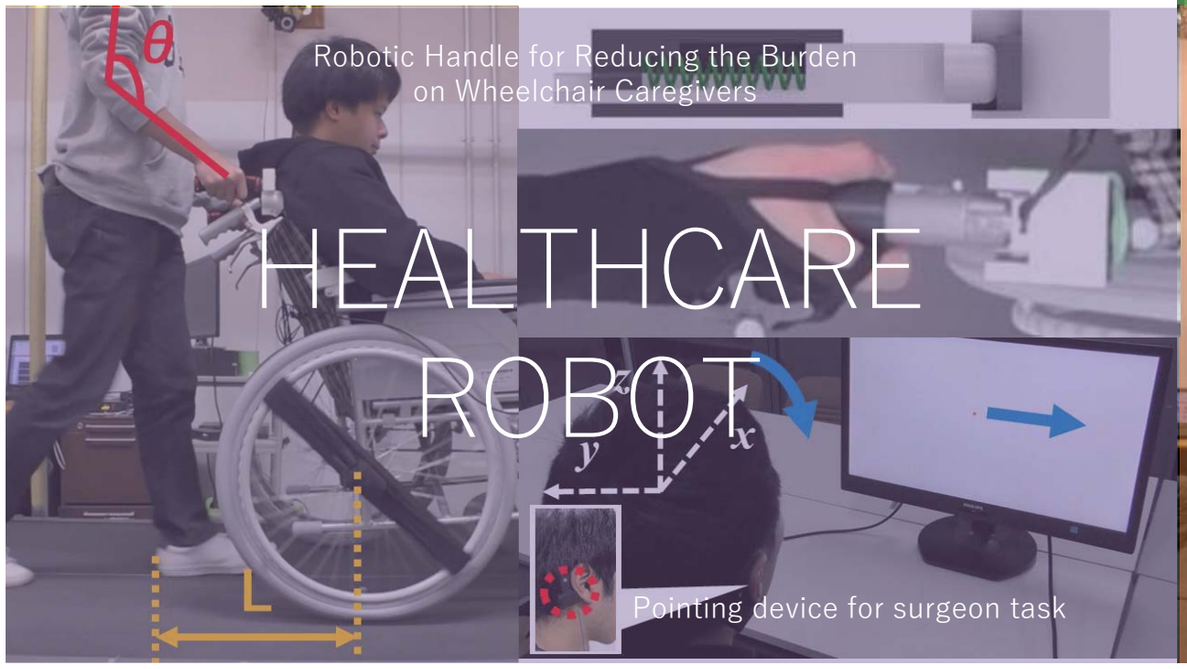
Yasutaka Nakashima Associate Professor

ASSIST ROBOT

Robotic Chair for Preventing Low Back Pain

Cane-Type Robot

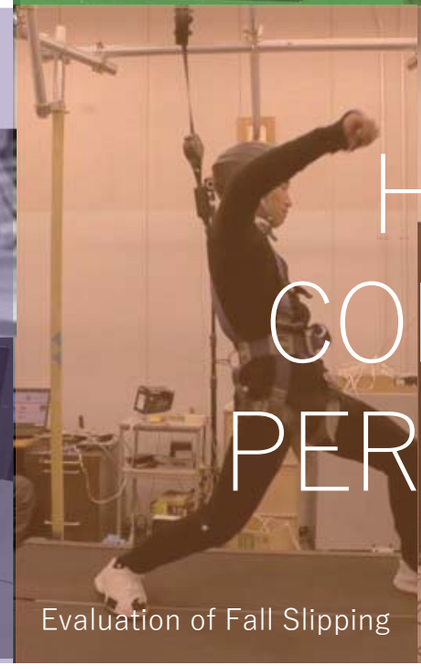
HEALTHCARE ROBOT



Robotic Handle for Reducing the Burden on Wheelchair Caregivers

Pointing device for surgeon task

HUMAN'S CONTROLLED PERFORMANCE



Evaluation of Fall Slipping

Standing Stability

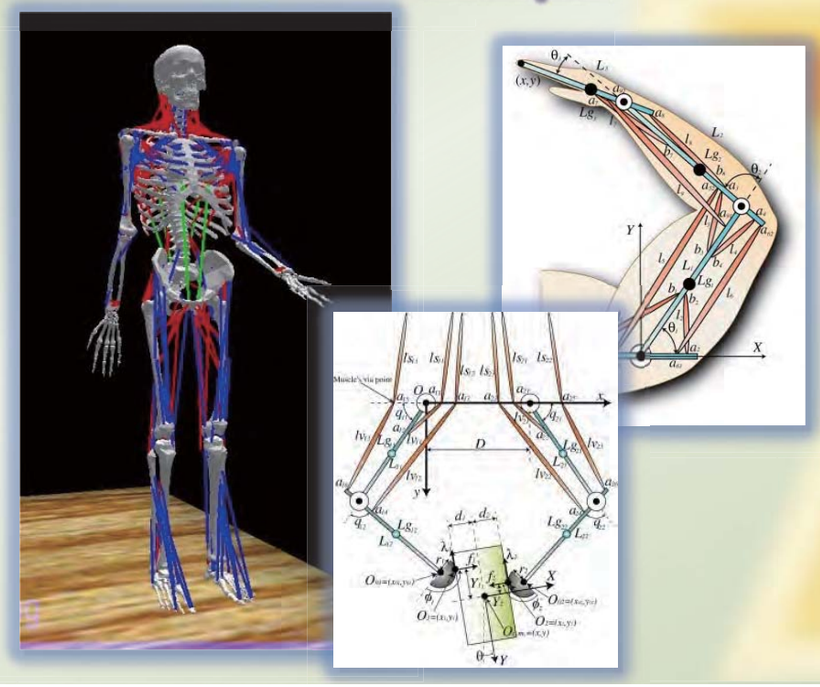
Gait with a Unilateral Load

KYUSHU UNIVERSITY

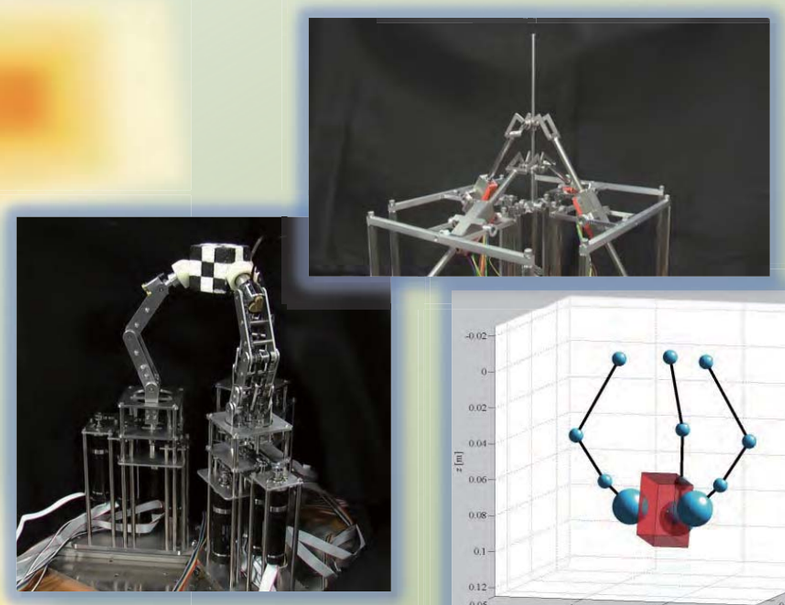
HUMAN-CENTERED ROBOTICS LABORATORY

- **From human to robotics**
  To realize the advanced motor intelligence of human's movements in robotics
- **From robotics to human**
  To realize flexible and dexterous robots that can support human's daily life

Numerical simulation for the musculoskeletal system



High-backdrivable parallel-link manipulator with CVT



Multi-fingered robotic hand

Manufacturing Process

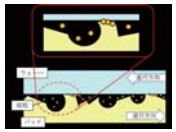
Precision Machining Lab.

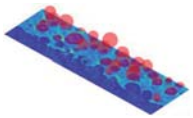
Professor Syuhei Kurokawa
Assoc. Prof. Terutake Hayashi
Assistant Prof. Keisuke Osawa

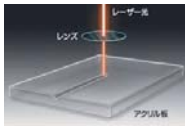
Development of the state-of-the-art manufacturing processes and measuring techniques for the green devices and machine elements


Gear, 3D shape (Measurement)


High speed cutting (Processing)


CMP (Processing)


Pad structure analysis (R&D)


Femto second laser ablation (Processing)

Nano particle diffusion (Measurement)

m (1) — mm ($1/10^3$) — μm ($1/10^6$) — nm ($1/10^9$)

Processing amount, Measurement volume

Accuracy (Processing, Measurement)

Giga range processing and evaluation

I . Ultra-Precision Manufacturing Technology

(1) CMP(Chemical Mechanical Polishing) for energy saving device materials
(SiC, Sapphire, Diamond, Silicon, GaN, Atmosphere controlled CMP machine, Slurry, Polishing pad, Recycling, etc.)

(2) Ultra-precision manufacturing and performance evaluation
(Ultra-high-speed hobbing of gears, Evaluation of Machined Surface Characteristics of Textured Gears, etc.)

II . Ultra-Precision Measuring Technology

(1) Optical measurement & evaluation (Nano particle sizing using fluorescent probe, etc.)

(2) R&D of 3D measurement and testing method
(Gear accuracy evaluation by whole circumference scanning measurement, etc.)

III . R&D of Creative Manufacturing Technique and Machines

(Three-Dimensional Internal Structure Analysis of CMP Polishing Pads Using X-ray CT , Low power laser processing with surface excitation, Particle sizing using nano particle chip, etc)

Material Processing Laboratory

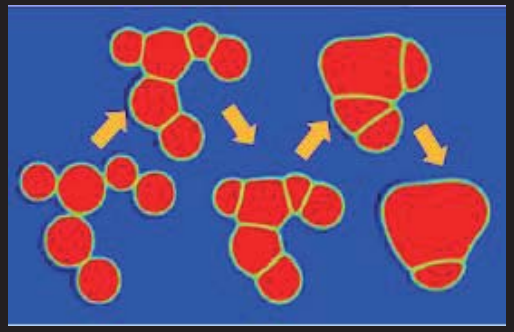
Prof. K. Shinagawa, Assoc. Prof. N. Yodoshi

Innovative Approaches to Manufacturing Science and Technology

In our laboratory, we conduct both analytical studies and process development on the sintering of powder materials such as metals and ceramics. The outcomes of our research contribute to a wide range of industrial applications.

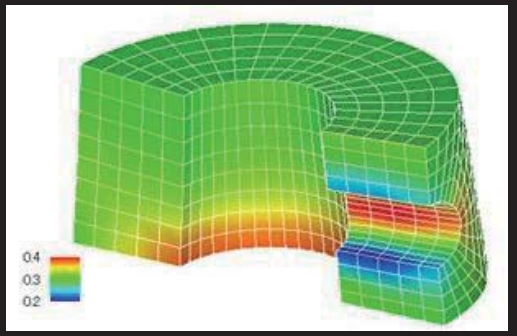
Analytical approach

Through various computational analyses of powder metallurgy processes, we elucidate sintering mechanisms and contribute to the development of highly precise and high-performance industrial products.



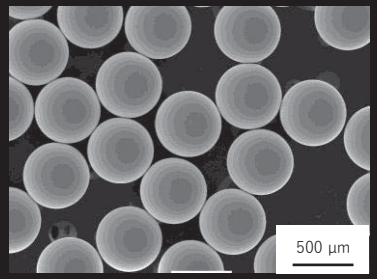
Examples of microstructural evolution during sintering simulated using the Phase-Field Method.

An example of part-scale sintering analysis using FEM. Changes in component shape and microstructure during sintering can be predicted.

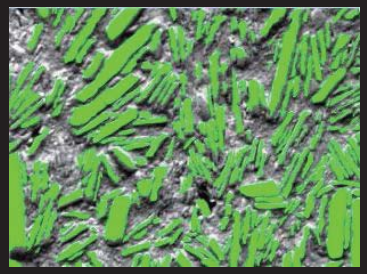


Experimental approach

We develop innovative manufacturing processes that enable next-generation materials and products.



Development of new process for producing functional particles (left)
Development of gas atomization process (right)

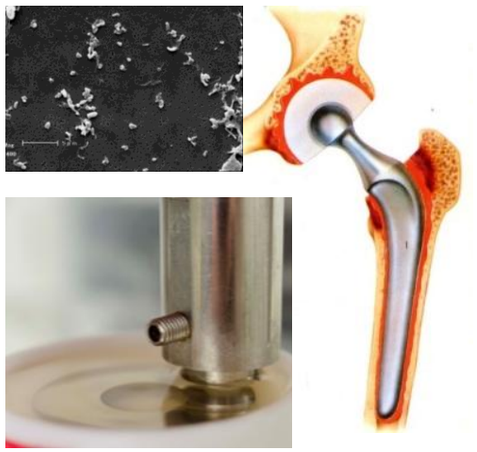


Metal Injection Molding (MIM) technology which can produce metal parts with complex shapes without machining (left)
Development of powder rolling process technology (right)

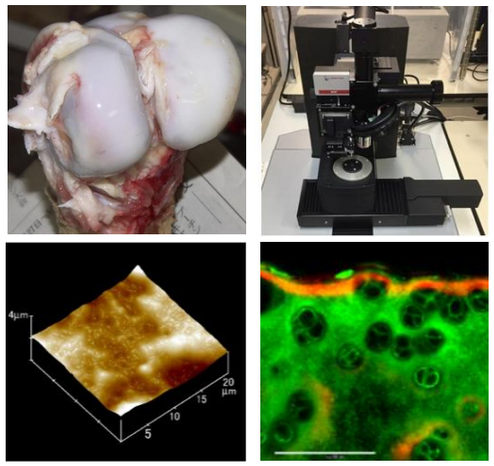
Machine Elements and Design Engineering Laboratory

Professor Yoshinori SAWAE,
Associate Professor Seido YARIMITSU, Assistant Professor Hironori SHINMORI

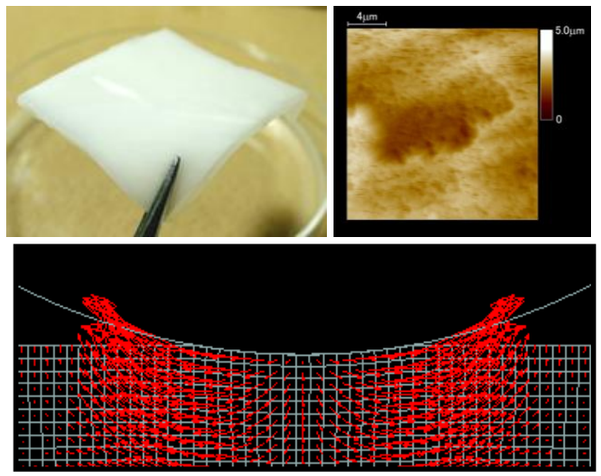
- Basic studies for establishing design guideline of machine elements used in various applications, from medical devices to machine components in hydrogen energy systems
- Tribology in biomedical engineering field is one of the main research target.



Wear of prosthetic joint materials

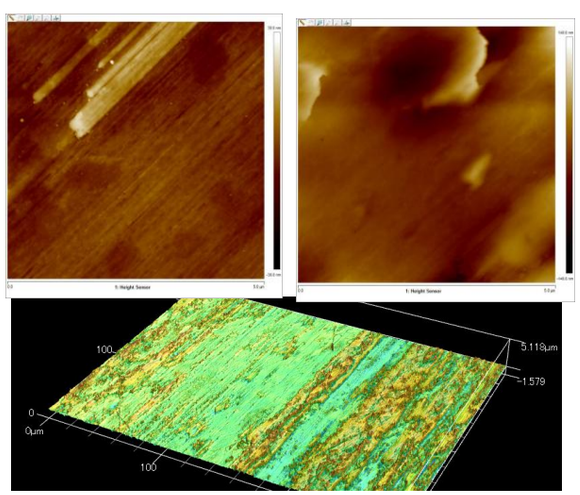


Superlubricity mechanisms in articular cartilage

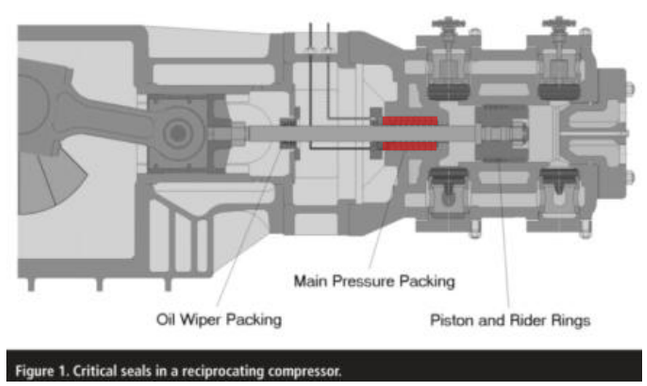


Friction mechanisms of highly hydrated hydrogels

Applications of bio-inspired hydrogels as tribomaterials



Super-low friction with self-assembled carbon transfer film

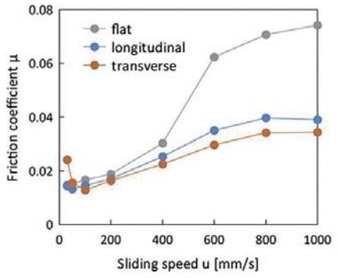


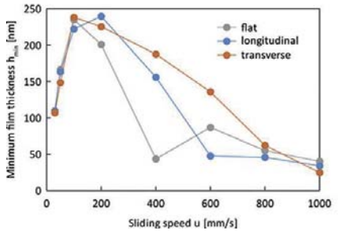
Wear of polymer seals in high pressure hydrogen

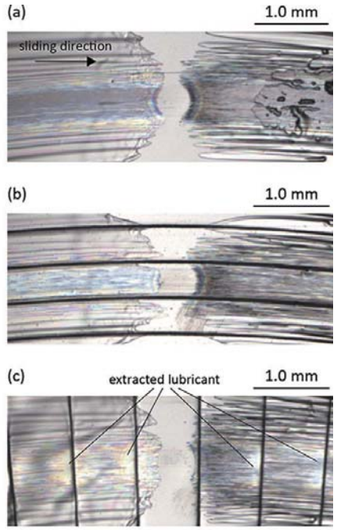
Tribology Laboratory

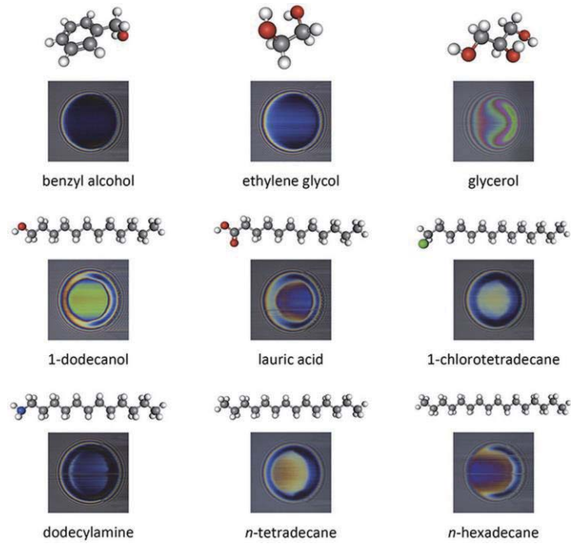
Prof. K. Yagi
Assoc. Prof. S. Kawada
Assist. Prof. H. Tanaka

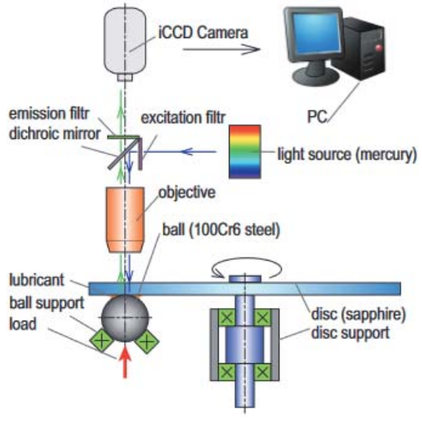
Tribology for energy saving and safety
Better understanding of complicated phenomena in friction areas

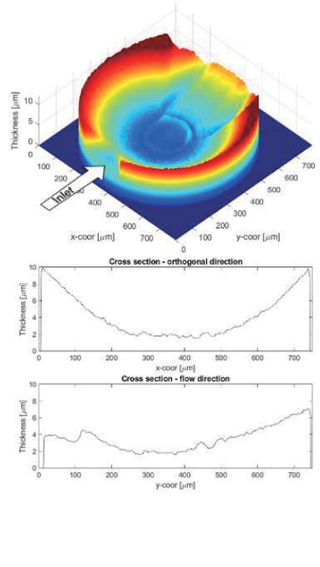




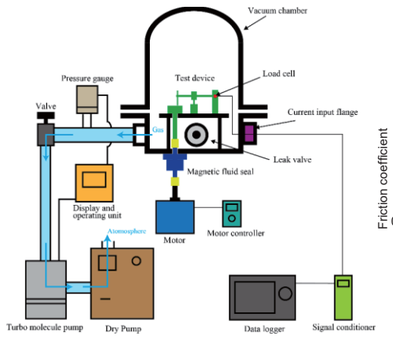


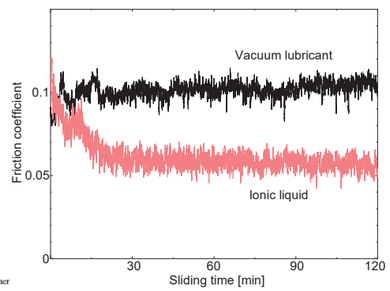






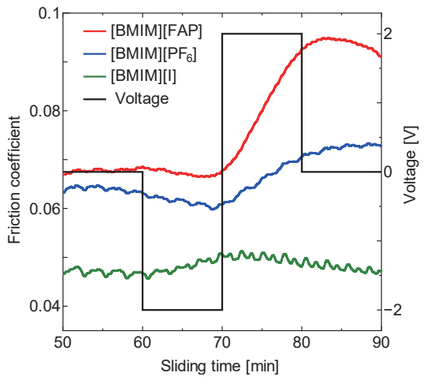
Improvement of lubrication performance by textured surface





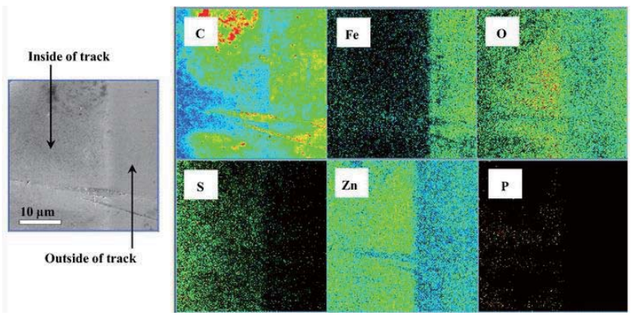
Evaluation of ionic liquids as vacuum and space lubricants

Observation of lubrication films



Development of active friction control system

Observation grease flow by fluorescence



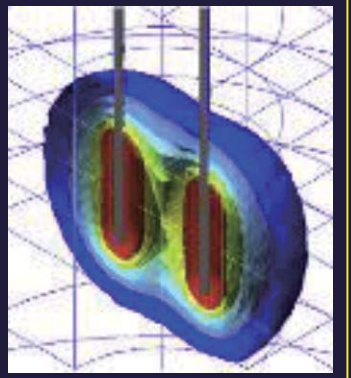
Element analysis of chemical reaction films in hydrogen environments

Biothermal Engineering Laboratory

Prof. Kosaku Kurata
Assoc. Prof. Jeonghyun Kim
Asst. Prof. Kosei Kawai

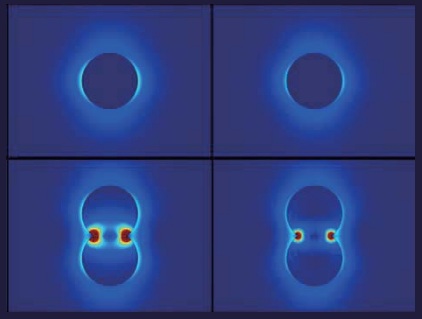
Interdisciplinary topics between bioengineering and thermal engineering

Tumor treatment by using high-voltage electric pulses



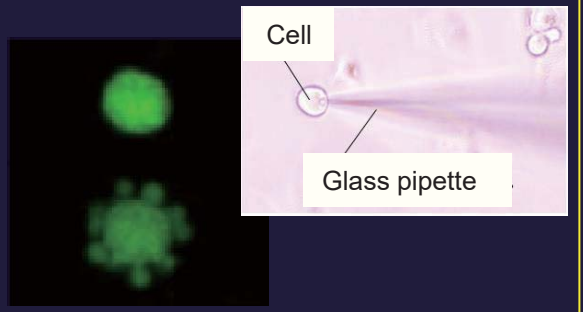
Simulation of electric field distribution around electrodes

Inhibition of tumor cell division by using weak electric fields



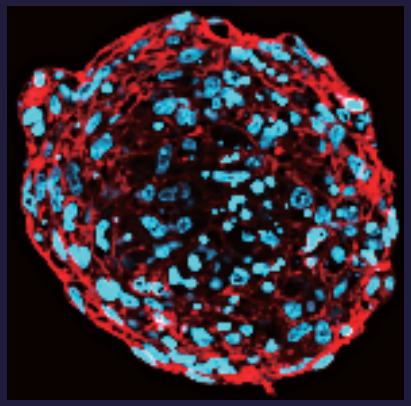
Difference of dielectrophoretic force distribution depending on cell shape

Understanding the process of cell membrane perforation and repair



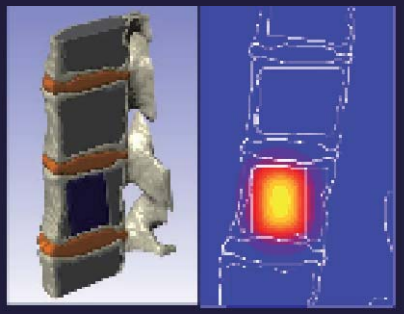
Membrane function measured by patch clamp method

3D culture model for bone



Bone spheroid derived from stem cells

Simulation of heat conduction during clinical treatment



Temperature rise induce by bone cement in spine

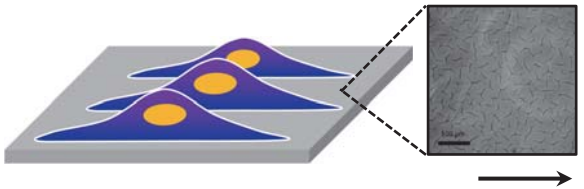
Development of open-source teaching materials for biological education

Easy-to-build open-source colorimeter

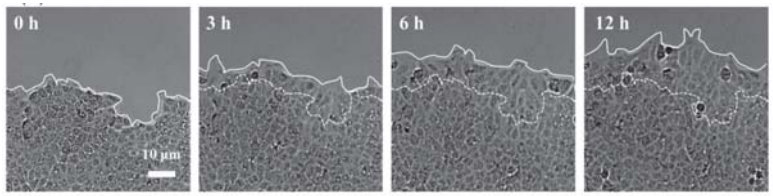
Biofunctional Enginnering Lab.

Porf. Susumu Kudo, Assoc. Porf. Naoki Takeishi, Assist. Prof. Saori Sasaki

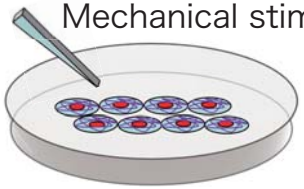
An overriding objective of our group is to elucidate how cells and tissue adapt to mechanical environments, and use this knowledge to gain a deeper understanding of mechanics of homeostasis and various diseases. Both experimental and computational approaches are employed to identify new hypothesis.



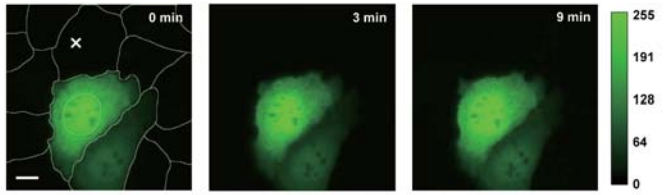
Biomimetic materials
(rigidity & cell migration)



Elucidation of cancer migration
▶ *Control of cancer metastasis*



Intercellular flow of
cancer inhibitor/promoter



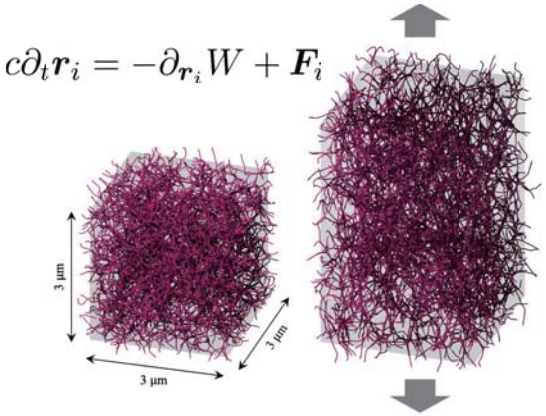
Elucidation of behavior of cancer inhibiter/promotor
▶ *Cancer detection/treatment*

GPGPU,
Deep learning,
AI, etc.

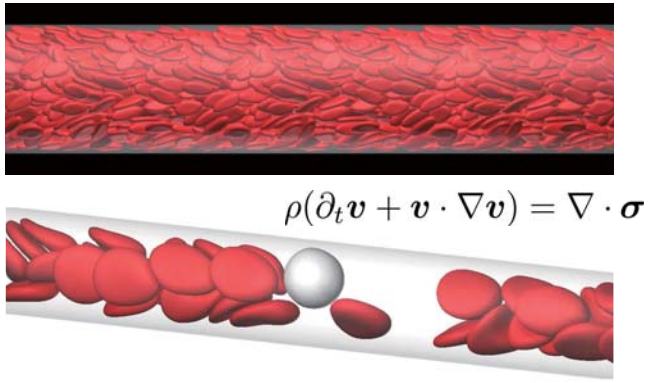
Numerical simulation

Cell experiment

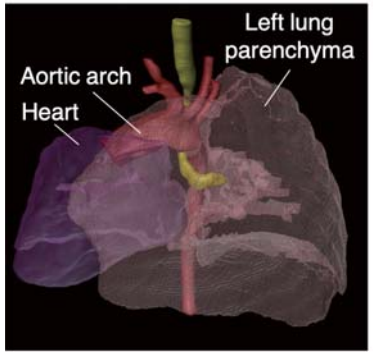
MEMS techniques,
Gene transfer,
Live imaging, AI, etc.

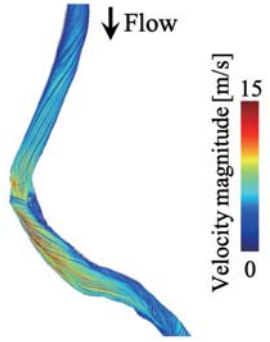


Stress for aggregated molecules



Cellular flow in microvessels





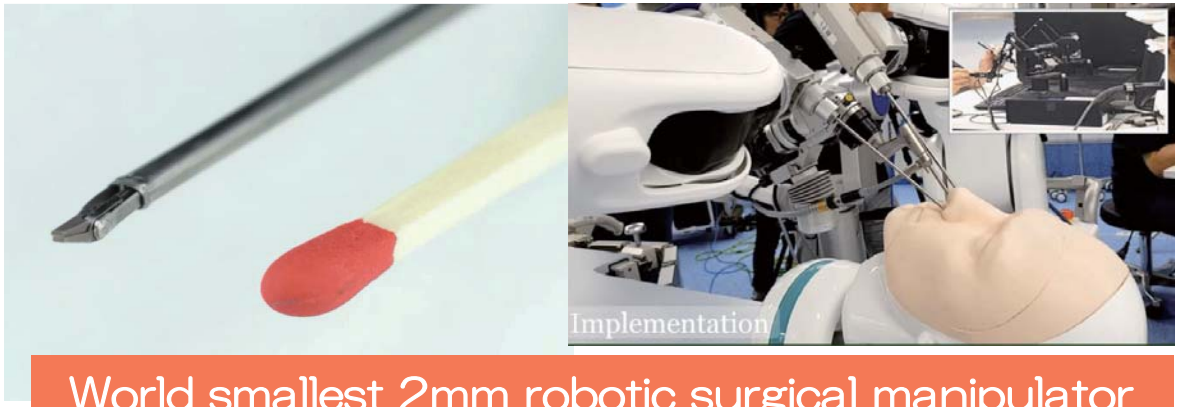
Respiratory performance in a patient

Advanced Medical Devices Lab.

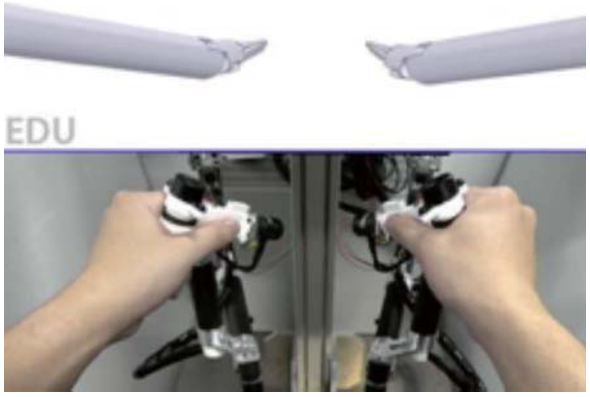
Prof. Jumpei Arata
Assistant Prof. D.S.V. Bandara

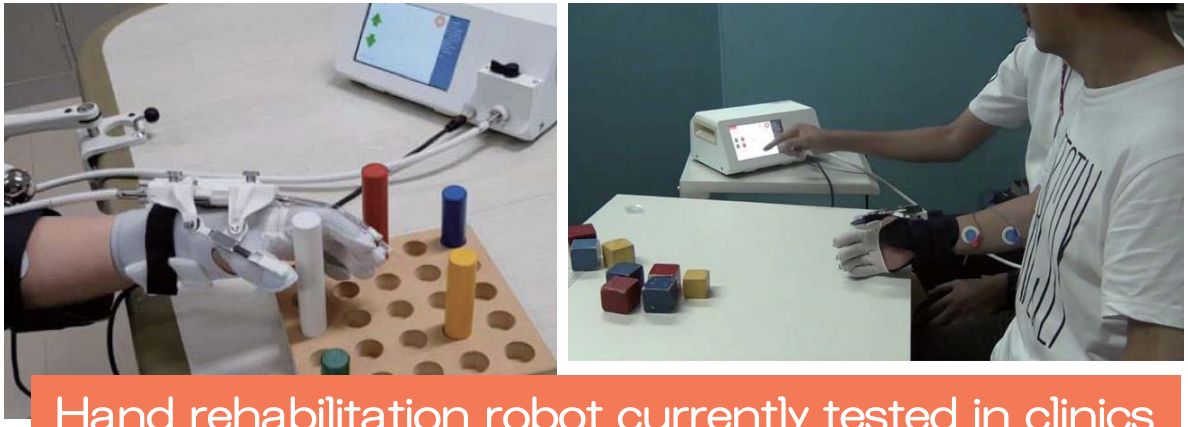
Research on new Medical Devices based on Robotics

Our research aims at new medical applications based on Robotic technology. Robotic technology includes many elements – mechanism, sensor, control, system integration and etc. We study about these elements to realize further effective medical applications. Find more on http://amd.mech.kyushu-u.ac.jp/



World smallest 2mm robotic surgical manipulator





Hand rehabilitation robot currently tested in clinics

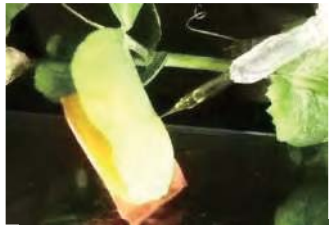
Tele-manipulation system for the orbital space station

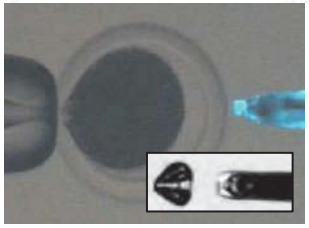
Biomedical Microfluidics Lab.

Profs. Yoko Yamanishi, Shinya Sakuma, Naotomo Tottori

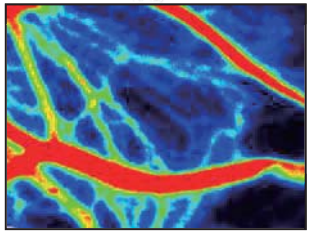
Biomedical Applications

Researches on Minimally invasive cell therapy





Needless injector for medical applications



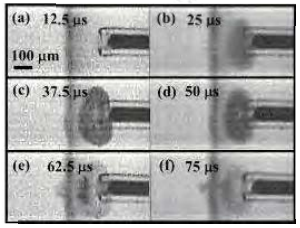
"Daily activities"

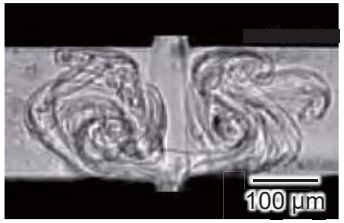
Discussion, Writing Journal, Presentation,
Design, Fabrication, Experiment, Analysis

"Seamless researches"
Fundamentals to Applications

Spatiotemporal microfluidics

Investigation of ultra-fast microfluids





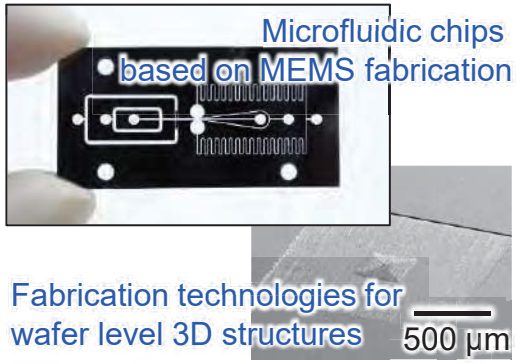
Novel medical devices & applications

Evaluation system of
Electrically induced bubbles

Cell manipulation & measurement
utilizing high-speed vision integrated system

Micro/Nano-mechatoronics

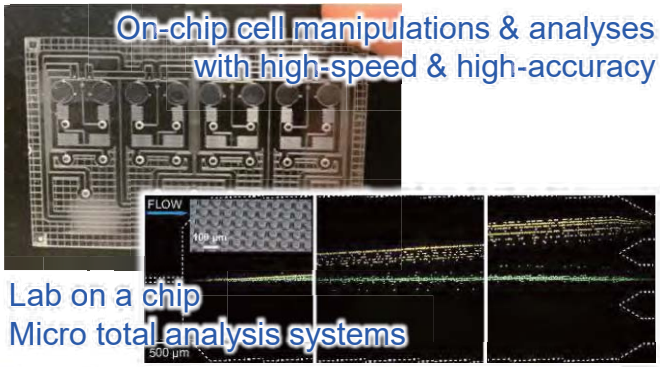
Microfluidic chips
based on MEMS fabrication



Fabrication technologies for
wafer level 3D structures

Microfabrication/MEMS

On-chip cell manipulations & analyses
with high-speed & high-accuracy



Lab on a chip
Micro total analysis systems

Fundamental micro/nano fluidics

Interdisciplinary researches on "Bio" "Medical" "Microfluidics (Mech. Eng.)"

Hydrogen Utilization Processes Laboratory

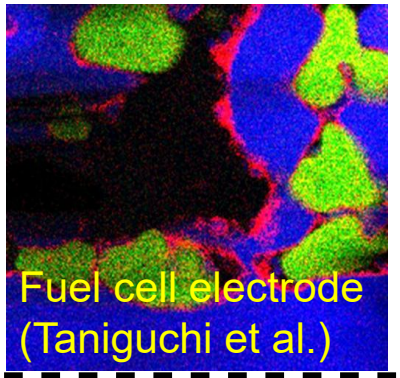
Prof. K. Sasaki, Assoc. Prof. Y. Tachikawa, Asst. Prof. Yasutake, et al.

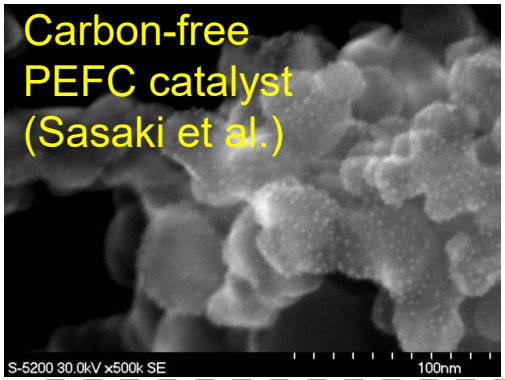
Research topic

Studies on Low-temperature Fuel Cells (PEFCs)

(Electric power units for mobility and portable applications)

- Novel electrocatalyst development and evaluation
- Next-generation proto-type cell development





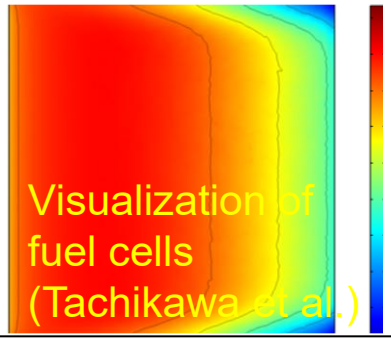
Studies on High-temperature Fuel Cells and Electrolysis Cells (SOCs)

（High electric efficiency & no precious metal）

- Cell materials and durability for reversible cells
- Visualization and system simulation

Fundamental Studies on Hydrogen Energy Related Technologies

- Hydrogen production from renewable energy
- Study on hydrogen sensors



You can learn research and development skills for fuel cells and related technologies!

"Fabrication of materials and cells ⇒ Measurement of cell performance and durability ⇒ Microscopic characterization and various electrochemical / materials analysis"

Fuel Cell Systems Lab.

Prof. Ito, Associate Prof. Kitahara
and Assistant Prof. Nakajima

Global demand for fuel cell and electrolyzer researches – Energy and environmental issues, global warming

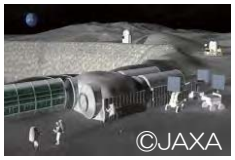
Electrolytic hydrogen production
from renewable energy

Fuel cell power generation for
residential and industrial use

Fuel cell vehicles

Marine fuel cells

Aircraft fuel cells



Space exploration

Mechanical Engineering

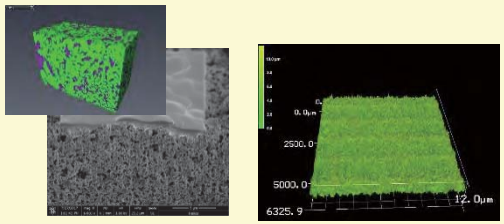
- Thermodynamics
- Heat transfer engineering
- Fluid dynamics

Fuel cell / Electrolyzer

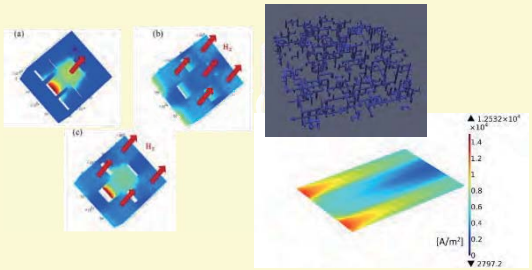
- Chemical/electrical energy conversion (PEFC • PEWE • SOFC • SOEC)
- High efficiency with direct conversion
- Without mechanical link

System

- 1＋1＝2？ • Optimization
- Measurement, analysis, and diagnostic techniques (Electrochemistry, imaging, permeation test)



Observation of 3D microstructure
of porous media



Heat, mass, and charge transport simulations

Experimental evaluation of physical
properties and performance

Proposal of optimal designs and novel structures with elucidation
of multiscale transport phenomena in fuel cells and electrolyzers

KYUSHU UNIVERSITY

https://www.mech.kyushu-u.ac.jp/~fcsl/en/

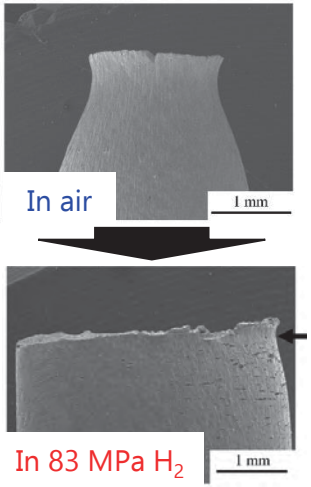
Hydrogen Storage Systems Laboratory

Prof. Hisao Matsunaga

Aims and scope

- Elucidate the **fundamental principles** of hydrogen embrittlement.
- Contribute to revisions of **domestic-** and **international-** regulations on material selection and strength design (e.g., design by rule and design by analysis) for components used in high-pressure gaseous hydrogen.
- Find and develop **new structural materials** having higher resistance to hydrogen with lower cost.

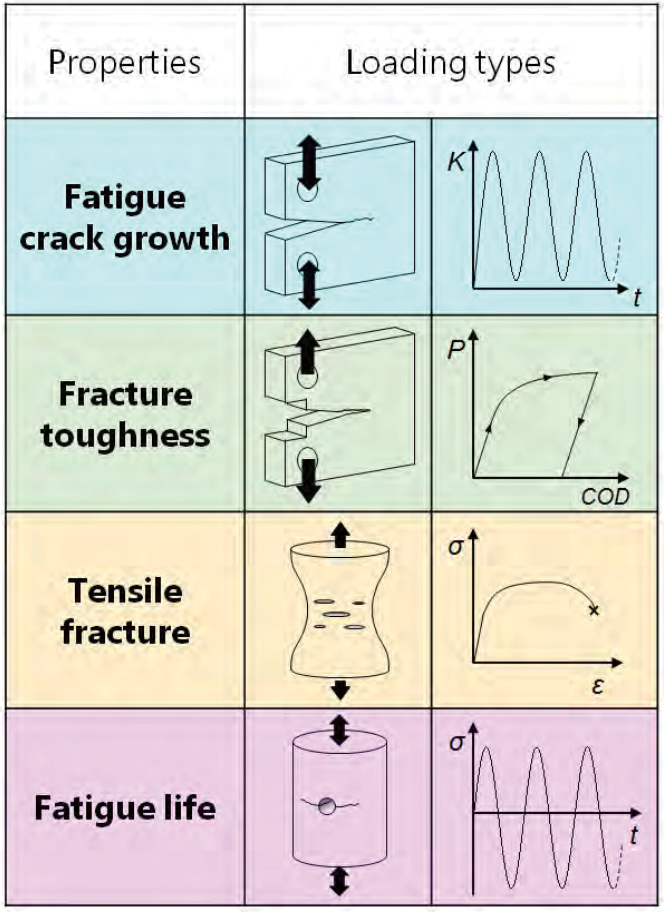
Material testing in high-pressure H_2 gas up to 140 MPa



Ductility loss of type 304 stainless steel in hydrogen gas

Contribution for safer and more economic hydrogen society

Strength properties which is necessary for the strength design of high-pressure hydrogen components



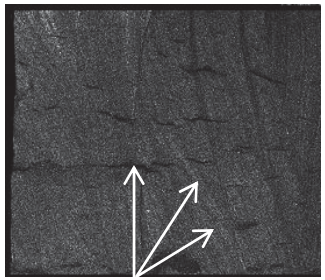
Keywords:
Hydrogen Storage, Hydrogen Embrittlement, Fatigue and Fracture, Strength Design, Regulation Review

Advanced Hydrogen Materials Lab.

Research topics

- Influence of fillers on hydrogen penetration properties and blister fracture of rubber composites for O-ring exposed to high-pressure hydrogen gas.
- Evaluation of sealing behavior of rubber O-ring in high pressure hydrogen gas.
- Development of rubber materials for diaphragm pump.
- Analyses of polymer materials after high-pressure hydrogen exposure.

Seal breaks after 100MPa, 30° C ×25 cycles

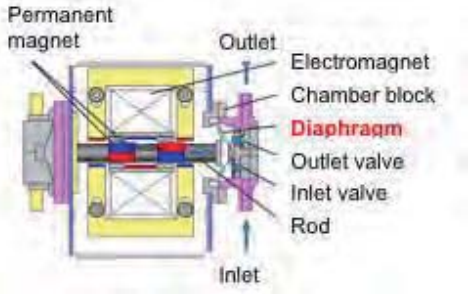


Analyses of mechanism of blister fracture of rubber materials during high-pressure hydrogen exposure

High durability rubber materials for O-ring of high-pressure hydrogen gas vessels

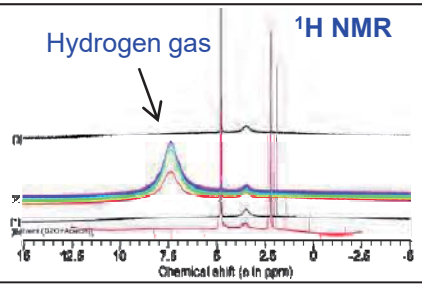
Evaluation of sealing behavior of rubber O-ring in high pressure hydrogen gas

High reliability high-pressure hydrogen gas seal design



Development of high frequency fatigue-resistant rubber materials

Long-life diaphragm pump for hydrogen gas



Analyses of polymer materials by NMR, IR, Raman spectroscopy and measurement of physical properties after high-pressure hydrogen exposure

Molecular design guidelines for polymer materials for hydrogen energy system