

One Day Symposium

NIMS-NTU Joint Symposium 2025 at NIMS

Thursday, November 20th

Namiki M-Cube Bldg. Meeting Room (213&214)

National Institute for Materials Science (NIMS)
National Taiwan University (NTU)

Organizers:

Yusuke Ide (Group Leader, Layered Nanochemistry Group, NIMS)

Junko Aimi (Senior Researcher, Molecular Mechatronics Group, NIMS)



国立研究開発法人 物質・材料研究機構
高分子・バイオ材料研究センター



Workshop Program

*Honorific titles are omitted

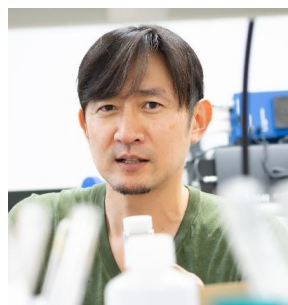
Opening Session		Chair: Yusuke Ide
9:30-9:40	Welcome address: Koji Kimoto Director of CBRM, NIMS	
9:40-9:50	Brief introduction of NIMS: Yusuke Ide, NIMS	
Session 2		Chair: Yusuke Ide
9:50-10:00	Brief introduction of NTU: Cheng-Liang Liu, NTU	
10:00-10:20	Naoyuki Kawamoto, NIMS	
10:20-10:40	Hsin-Jay Wu, NTU	
10:40-11:00	Isao Okubo, NIMS	
11:00-11:20	Chien-Hsin Wu, NTU	
11:20-11:40	Shigeki Kawai, NIMS	
11:40-12:00	Ying-Yin Huang, NTU	
12:00-13:10	Group Photo and Lunch Break	
Session 3		Chair: Jiashing Yu
13:10-13:30	Shrestha Lok Kumar, NIMS	
13:30-13:50	Wen-Yueh Yu, NTU	

13:50-14:10	Joel Henzie, NIMS
14:10-14:30	Hui-Hsin Hsiao, NTU
14:30-14:50	Coffee Break
Session 4	
Chair: Junko Aimi	
14:50-15:10	Takashi Nakanishi, NIMS
15:10-15:30	Jiashing Yu, NTU
15:30-15:50	Mizuki Tenjimbayashi, NIMS
15:50-16:10	Zih-Yin Chen, NTU
16:10-16:30	Coffee Break
Session 5	
Chair: Wen-Yueh Yu	
16:30-16:50	Yuan-Hui Chueh, NTU
16:50-17:10	Masahiro Kusano, NIMS
17:10-17:30	Te-Cheng Su, NTU
Closing Session	
Chair: Yusuke Ide	
17:30-17:40	Yusuke Ide, NIMS; Cheng-Liang Liu, NTU
Banquet	
18:30-20:30	三浦食堂

Laboratory tour (November 21st)

*Honorific titles are omitted

Sengen site		Attendant: Junko Aimi & Yusuke Ide
9:15-09:35	Materials Preparation Factory #103 Masahiro Kusano (Additive Manufacturing Group)	
Namiki site		Attendant: Yusuke Ide
10:05-10:25	NanoGREEN Building #301&302 Isao Okubo (Thermal Energy Materials Group)	
10:30-10:50	MANA Building #508 Henzie Joel (Functional Chromophores Group)	
10:50-11:10	MANA Building #316 Mizuki Tenjimbayashi (Independent Researcher)	
11:10-11:30	WPI-MANA Building #W-309 Supramolecule Group (Shrestha Lok Kumar)	
11:30-11:50	High Voltage Electron Microscope Laboratory #107 Electron Microscopy Group (Naoyuki Kawamoto)	
11:50-12:40	Lunch Break	
Sengen site		Attendant: Yusuke Ide & Junko Aimi
13:00-13:20	Interface Science Laboratories #101 Shigeki Kawai (Nanoprobe Group)	
13:20-14:20	Individual Discussion	

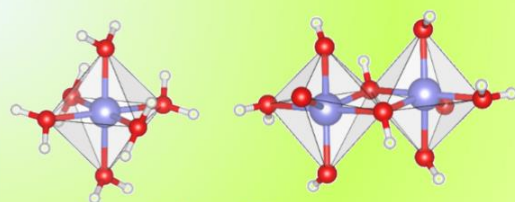


Yusuke IDE (井出 裕介)

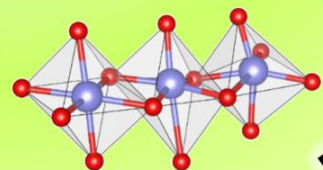
Group Leader

Layered Nanochemistry Group, Research Center for Materials Nanoarchitectonics (WPI-MANA)

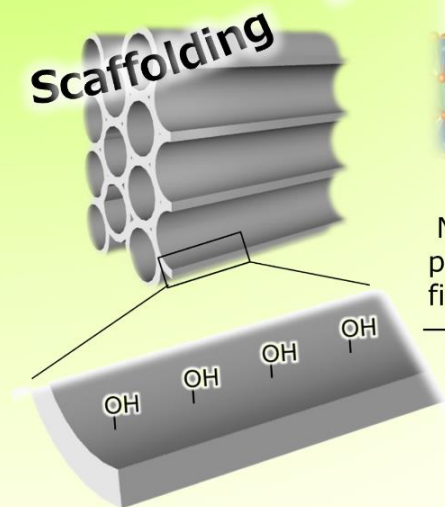
Research Keywords: Iron, Iron-oxo oligomers, Layered silicates, Clay minerals, Mesoporous silicas, Zeolites, UV shielding, Sunscreen, (Photo)catalysis, Pyrocatalysis, Adsorption/separation, Ion exchange



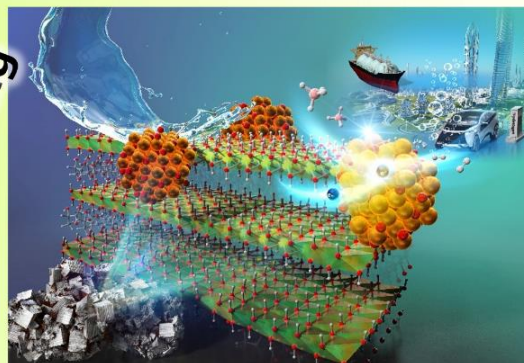
Fleeting Fe-oxo oligomers



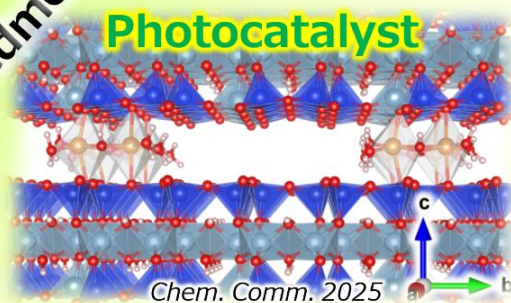
Scaffolding



Self-assembling



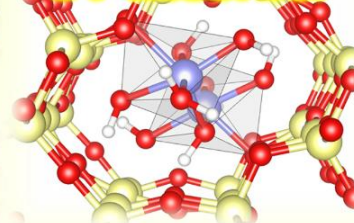
Embedment



Photocatalyst

Chem. Comm. 2025

UV absorber



Chem. Sci. 2018

Catalyst for H₂

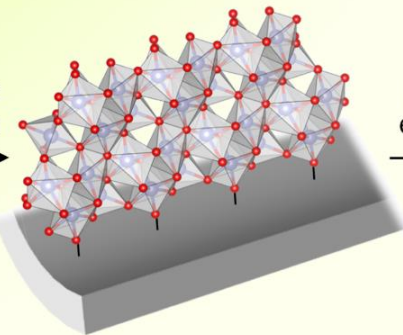
ACS Catal. 2025
Patent pending*not published
ACS SCE 2023
Appl. Catal. B 2021

Safe cosmetic & sunscreen products

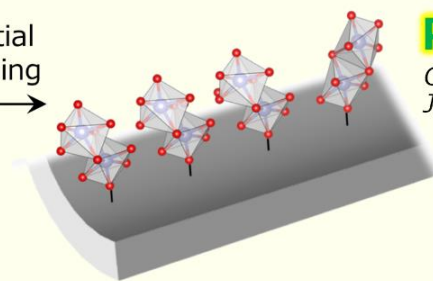


Mater. Today Nano 2022 ACS AMI 2024
WO2025158720A1 (PCT)

Nano-particle fixation



Partial etching



Photocatalyst

Chem. Sci. 2019
J. Mater. Chem. A 2018



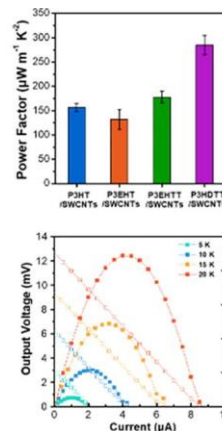
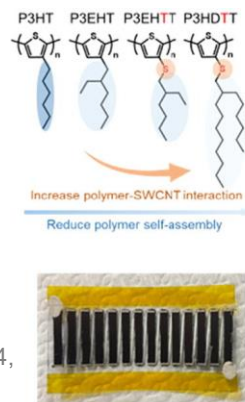
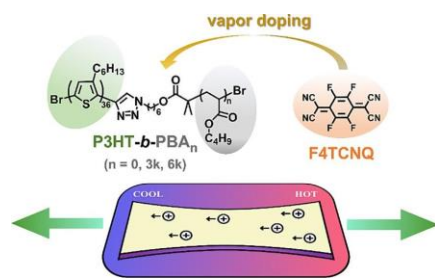
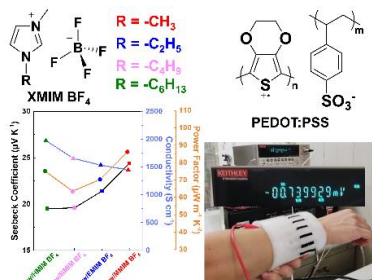
Prof. Cheng-Liang Liu (劉振良)

Organic Polymer Materials and Devices Lab, Dept. of Materials Science and Engineering

Research Keywords: Electronic and optoelectronic polymer, organic thermoelectrics, hybrid thermoelectrics, organic electronics, solution-processing, transistor, solar cell
Organic/Composite Thermoelectrics for Low-grade Waste Heat Harvesting



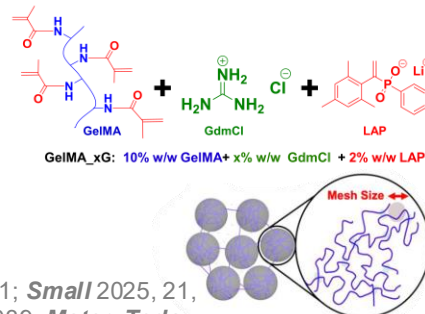
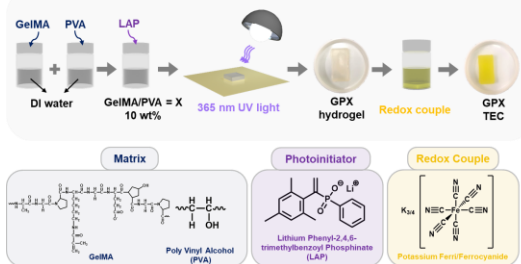
Doped Conjugate Polymers



Chem. Eng. J. 2025, 523, 168612; *Chem. Eng. J.* 2025, 521, 166861; *J. Mater. Chem. A* 2025, 13, 31542; *J. Colloid. Interface Sci.* 2025 699, 138299; *J. Mater. Chem. A* 2025, 13, 3551; *ACS Appl. Mater. Interfaces* 2024, 16, 67116; *Adv. Funct. Mater.* 2024, 24, 2406165; *Composite Part B* 2024, 286, 111779; *J. Mater. Chem. C* 2024, 12, 7446; *Mater. Today Chem.* 2024, 38, 102129; *Chem. Eng. J.* 2024, 485, 149732; *Small* 2024, 20, 2306166; *ACS Appl. Energy Mater.* 2023, 6, 2602; *ACS Appl. Mater. Interfaces* 2023, 15, 56116; *J. Mater. Chem. A* 2023, 11, 24890; *Chem. Eng. J.* 2023, 458, 141366; *ACS Appl. Energy Mater.* 2023, 4, 2602

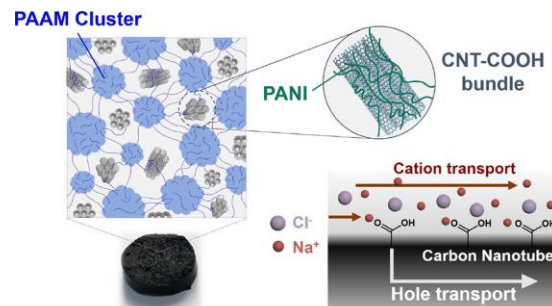
ACS Appl. Energy Mater. 2025, 8, 13499; *Adv. Sci.* 2024, 11, 2410046; *Polymer* 2024, 312, 127619; *Small* 2024, 20, 2401966; *ACS Appl. Mater. Interfaces* 2024, 16, 3764; *J. Mater. Chem. A* 2024, 12, 9806; *Synth. Met.* 2024, 307, 117682; *Chem. Eng. J.* 2023, 472, 145121; *J. Mater. Chem. C* 2023, 11, 6874; *J. Mater. Chem. A* 2023, 11, 17901; *J. Power Sources* 2023, 556, 232516; *J. Mater. Chem. A* 2022, 10, 18792

Gel-based Thermogalvanic Cell

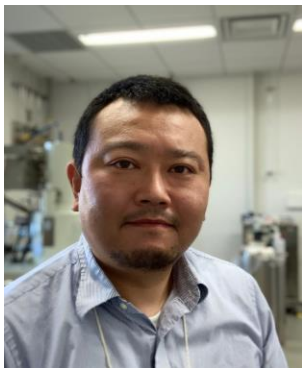


ACS Sustainable Chem. Eng. 2025, 13, 10, 4231; *Small* 2025, 21, 2407622; *Adv. Sustainable Syst.* 2024, 8, 2400039; *Mater. Today Energy* 2024, 42, 101546; *J. Power Sources* 2024, 609, 234647

Gel-based Ionic Thermoelectric



J. Mater. Chem. A 2025, 13, 10655; *ACS Appl. Mater. Interfaces* 2025, 17, 38545; *Macromol. Rapid Commun.* 2025, 46, 2400837; *Adv. Energy Mater.* 2025, 15, 2405502; *Small* 2024, 20, 2311811; *ACS Appl. Mater. Interfaces* 2023, 15, 56072; *Mater. Today Energy* 2023, 37, 101383



Naoyuki KAWAMOTO (川本 直幸)

Principal researcher

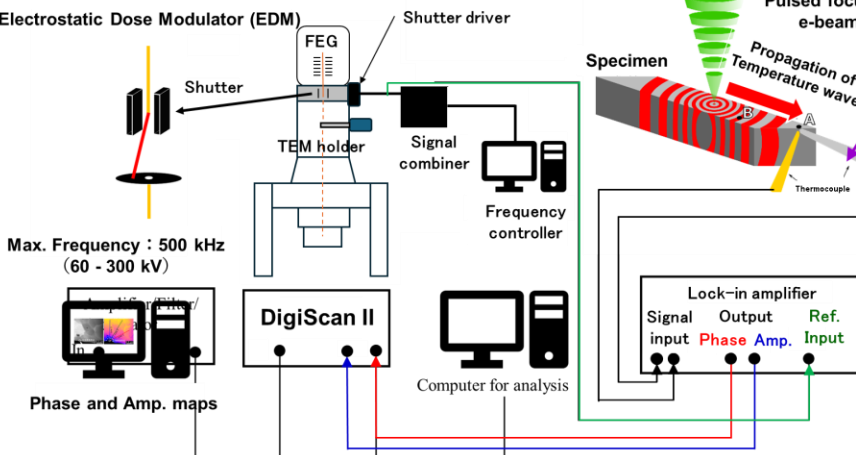
Electron Microscopy Group, Center for Basic Research on Materials (CBRM)

Research Keywords: Transmission electron microscopy, thermal diffusivity measurement, pulsed electron beam, heatsink composite, thermoelectric materials, nanothermocouple

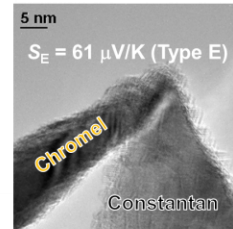
Nanoscale thermal measurement method in pulsed STEM

1) H. D. Nguyen, N. Kawamoto, et al., Sci. Adv.10, ead3825 (2024)

IDES JEOL JEM-3100FEF, JEM-ARM300F GRAND ARM



Our original nanothermocouple^{2,3)}



2) Y. Kakefuda, N. Kawamoto et al., e-J. Surf. Sci. Nanotechnol. 17 (2019) 102-107.

3) N. Kawamoto et al., Nano Energy, 52 (2018) 323-328.

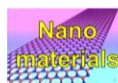
Nanoscale observations

by JEM-ARM300F Grand ARM



Microstructure Physical properties

Grain boundaries, composites, Lattice defects, impurities, Thin-films, Low dimensioning...



In-situ TEM holders

Electrical



Mechanical



Optical



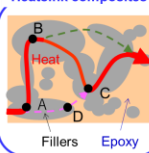
Thermal

2 probe TEM holder



Heat dissipation ← Nanostructure → Heat insulation

Heatsink composites



Thermoelectric materials

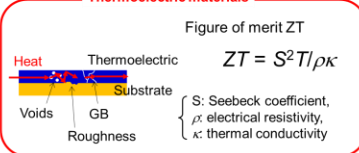
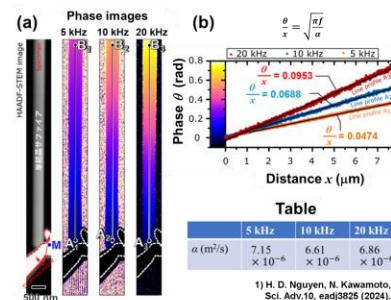


Figure of merit ZT

$$ZT = S^2 T / \rho \kappa$$

S: Seebeck coefficient, ρ : electrical resistivity, κ : thermal conductivity



Table

	5 kHz	10 kHz	20 kHz
α (m ² /s)	7.15×10^{-6}	6.61×10^{-6}	6.86×10^{-6}

1) H. D. Nguyen, N. Kawamoto, et al., Sci. Adv.10, ead3825 (2024).

Simultaneous measurements of microstructure and Heat conduction in sink composites, semiconductors, and so on

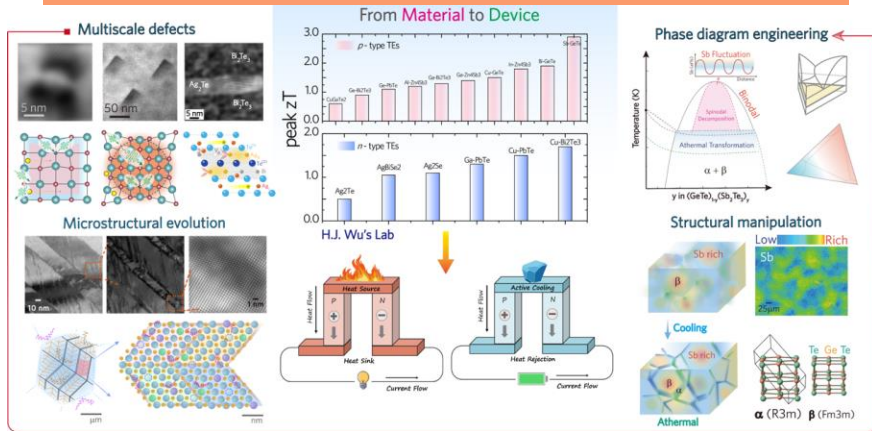
Prof. Hsin-Jay Wu (吳欣潔)

Advanced Thermoelectric Materials & Green Energy Lab, Dept. of Materials Science and Engineering

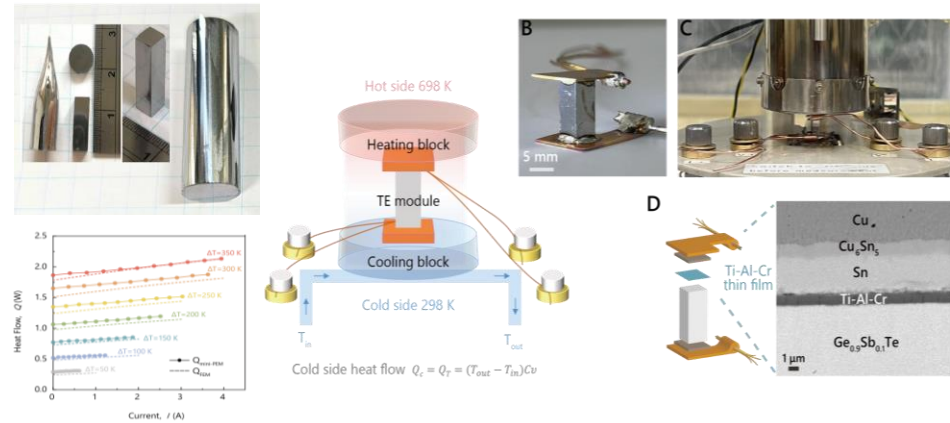
Research Keywords: Thermoelectric materials and devices, Solid-state energy materials, metallography, Single crystal growth, transport properties measurements



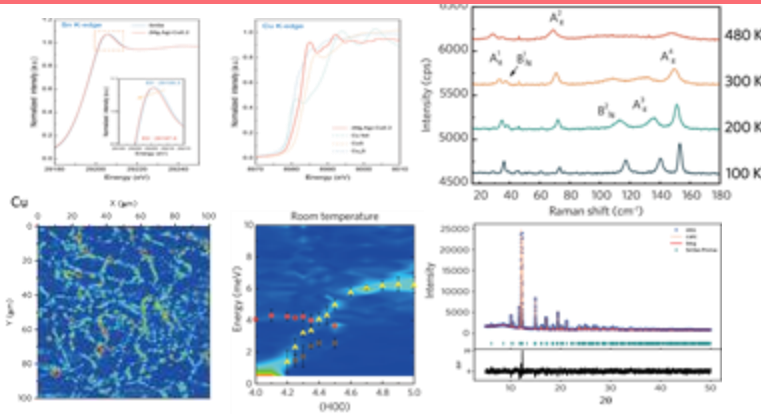
Research roadmap



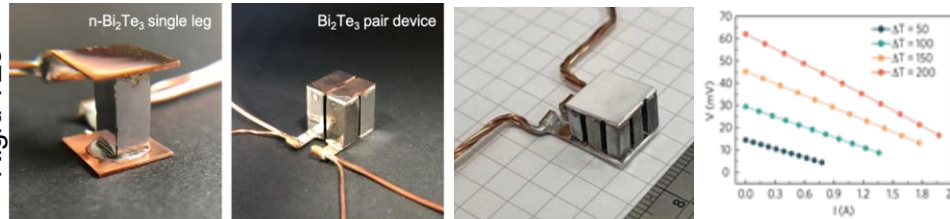
Single-crystal growth, Module assembly & Efficiency measurement



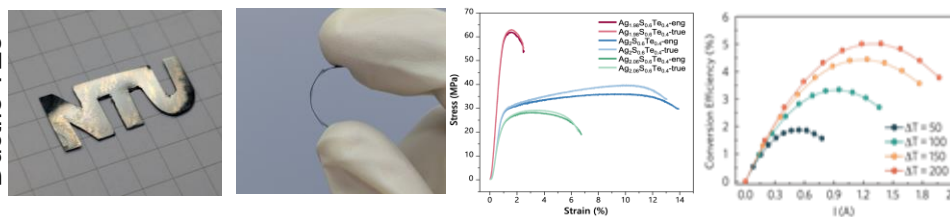
Characterizations



Rigid TEs



Ductile TEs





Isao Ohkubo(大久保 勇男)

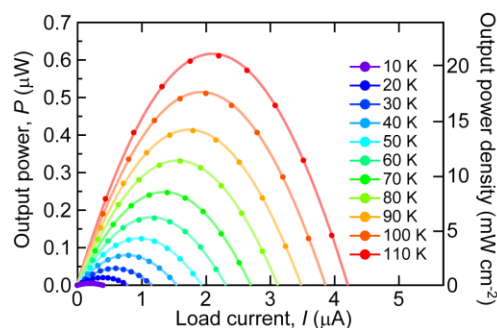
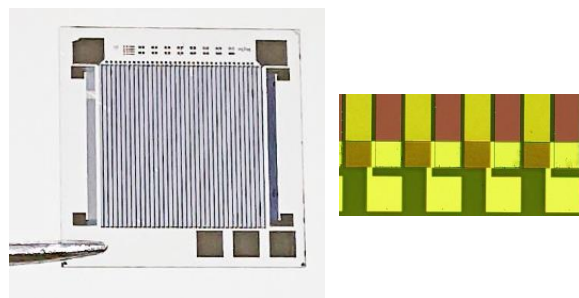
Principal Researcher

Thermal Energy Materials Group,

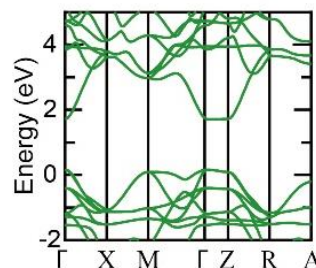
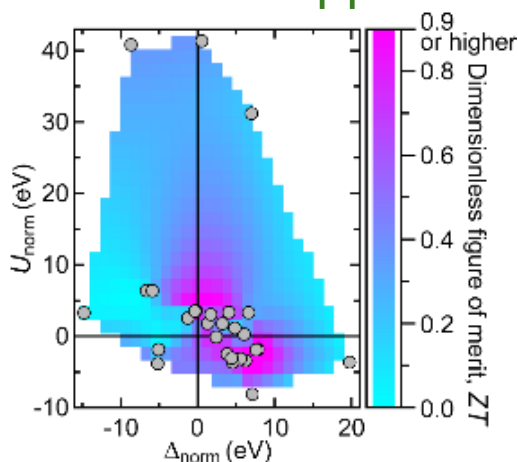
Research Center for Materials Nanoarchitectonics (WPI-MANA)

Research Keywords: Thermoelectric materials & devices, Epitaxial thin film growth, Ionic inorganic compounds, Electronic structure calculations, Machine learning

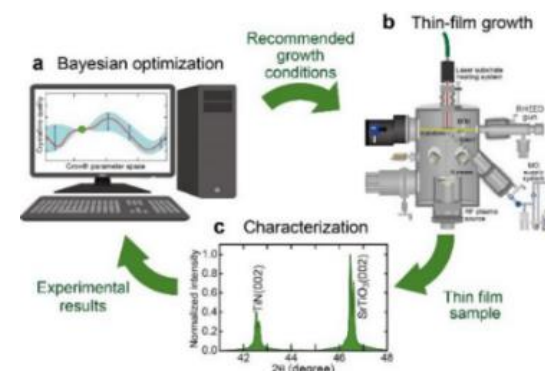
● Thermoelectric devices ● Informatics approaches ● ML-assisted thin-film growth



Mater. Today Energy **28**, 101075 (2022).
Appl. Phys. Lett. **122**, 243901 (2023).
 etc.



J. Am. Chem. Soc. **144**, 3590 (2022).
Dalton Trans. **49**, 431 (2020). etc.



Mater. Today Phys. **16**, 100296 (2021).
JSAP Review 220401 (2022). etc.



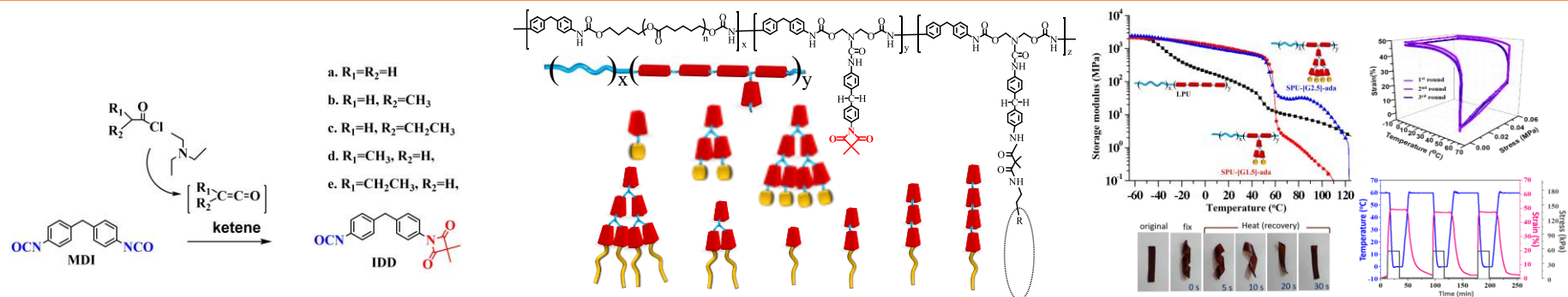
Dr. Chien-Hsin Wu (吳建欣)

POLYSUS Lab, Advanced Research Center for Green Materials Science and Technology

Research Keywords: Design of polymer structures and functional properties; Polymer recycling and reuse; Waterborne polymers and coatings; Scale-up

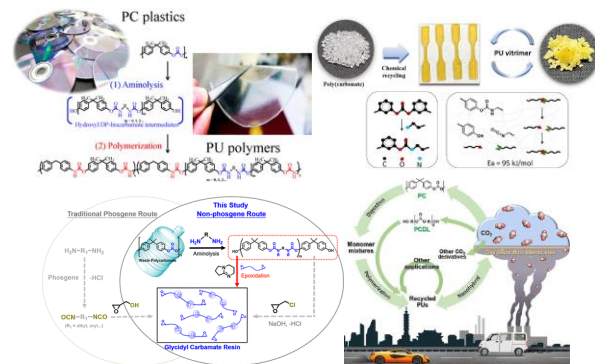


Design and engineering of polymer intermediates, architectures, and functional properties



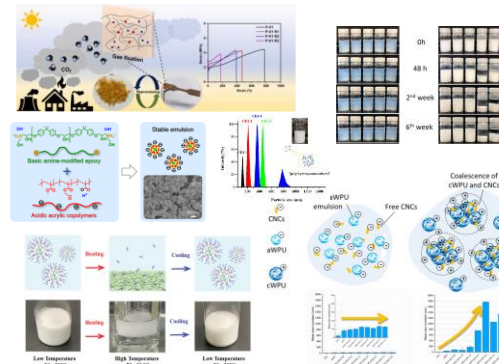
RSC Advances 5, 16897–16910 (2015); *RSC Advances* 6, 91981–9199 (2016); *Polymer* 119(6) 1–12 (2017); *Polymers* 9(3), 93 (2017); *Macromol. Mater. Eng.* 303, 1700433 (2018); *Macromolecules* 52(3), 959–967 (2019); *Applied Surface Science* 469, 887–895 (2019); *Polymers* 11(9), 1473 (2019); *Polymer* 210(1), 123075 (2020); *Advanced Electronic Materials* 7(2), 2000870 (2021); *Chemical Engineering Journal* 420 (2), 129821 (2021); *ACS Applied Polymer Materials* 4(1), 240–249 (2022); *Journal of Materials Chemistry C* 10, 12232–12248 (2022); *ACS Applied Polymer Materials* 5(3), 1765–1774 (2023); *Separation and Purification Technology* 327, 124981 (2023); *ACS Applied Polymer Materials* 6(6), 3222–3232 (2024); *Chemical Engineering Journal* 522(15), 167148 (2025)

Polymer recycling and reuse



ACS Sustainable Chemical Engineering 6(7), 8964 (2018); *Polymer* 212(6), 123296 (2021); *Chemical Engineering Journal Advances* 11, 100316 (2022); *Chemical Engineering Journal* 452, 139262 (2023); *Journal of Environmental Chemical Engineering* 11, 6, 111170, (2023); *ACS Sustainable Chemical Engineering* 11(51), 17907–17919, (2023)

Waterborne polymers and coatings



Polymer 119(20), 122464 (2020); *Macromolecular Materials and Engineering* 2100668 (2021); *Cellulose* 30, 2217–2234, (2023); *Progress in Organic Coatings* 184, 107840 (2023); *Journal of Environmental Chemical Engineering* 11, 6, 111170, (2023); *ACS Applied Polymer Materials* 6, 828–836 (2024); *ACS Applied Polymer Materials* 7(10), 6513–6522 (2025)

Shigeki KAWAI (川井 茂樹)

Group Leader

Nanoprobe Group, Center for Basic Research on Materials

Research Keywords: On-surface chemistry, High-resolution scanning probe microscopy, On-surface synthesis, Local Probe chemistry, Nanocarbon materials, Single molecules, Spin

A. High-resolution LT-AFM/STM



Instrumentation

C. Carbon nanomaterial

On-surface synthesis

On-surface chemical reaction
→ small molecule as a piece
for nano-structure.

Tip-induced local chemistry

→ Single molecule reaction
by tunneling current

Function

Mechanical / electronic /
magnetic properties
→ in-situ probe measurement

B. Local probe chemistry

Single molecule

Electronic/structural property

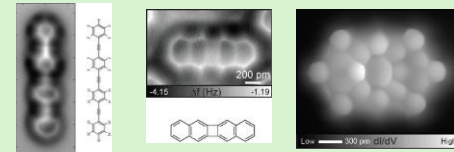
Intermolecular bond

Self-assembly

Reactivity

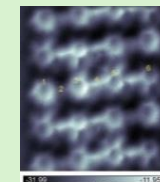
Force measurement

π -electron state

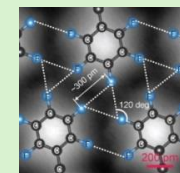


Nano Lett. 2014 ACS Nano 2017 JACS 2020

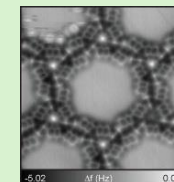
Self-assembly



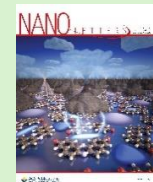
ACS Nano (2013)



ACS Nano (2015)

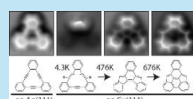


Nat. Comm. (2017)

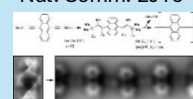


Nano Lett. (2021)

On-surface reaction



Nat. Comm. 2016



ACS Nano 2018



ACIE 2021, Nat. Comm. 2023



Angewandte Chemie 2021

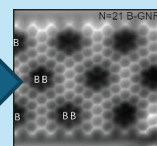


ACIE 2021

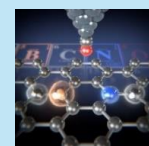


ACIE 2022

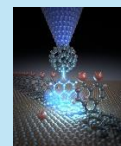
Carbon nanostructures



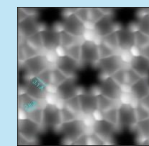
Nat. Comm. 2015



Sci. Adv. 2018

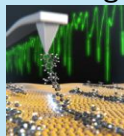


Sci. Adv. 2020



Nat. Chem. 2023

Peeling



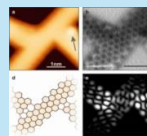
PNAS 2014

Superlubricity



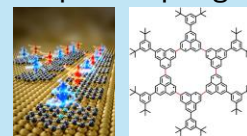
Science 2016
ACS Nano 2019

Junction



Nano Lett 2016
Nano Lett 2017

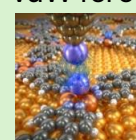
Spin coupling



ACS Nano 2022, ACIE 2023/2024,
Sci. Adv. 2025, JACS 2025

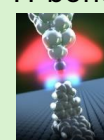
Force detection

vdW force



Nat. Comm. (2016)

H-bond



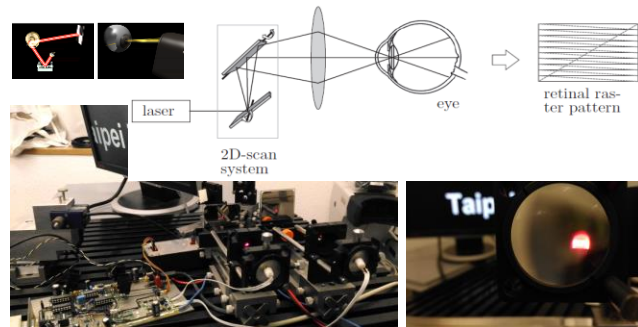
Sci. Adv. (2017)

Associate Prof. Rudy Ying-Yin Huang (黃滢瑛)

Human Factors Engineering Lab, Dept. of Mechanical Engineering

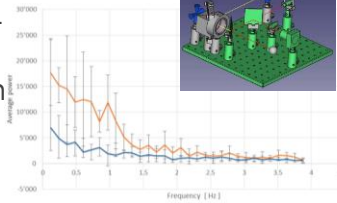
Research Keywords: Visual ergonomics, human factors engineering, simulation & training, VR/AR/MR & CPS, smart manufacturing, UI & UX, HCI, mental workload

VRD (virtual retinal display)

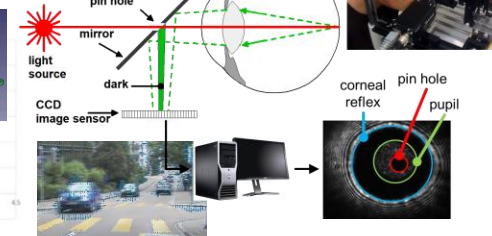


Visual Ergonomics

- 👁️ Vergence-accommodation conflict (VAC)
- 👁️ Cybersickness, microfluctuation & visual fatigue
- 👁️ Dynamic contrast vision recovering mechanism
- 👁️ Spatial visual attention

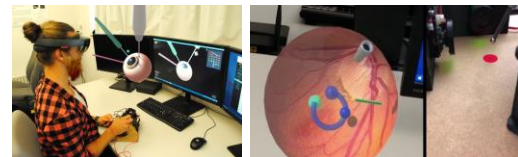


- ❖ Cybersickness & visual fatigue – Microfluctuation, optic flow, entropy motion value (EMV)

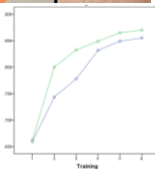


VR/AR/MR & CPS (cyber-physical sys.)

- 👁️ Immersive industrial human-robot collaboration
- 👁️ AR microsurgery training
- 👁️ Workplace design
- 👁️ (AI)AR-assisted system



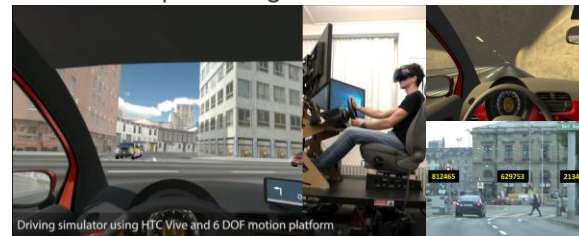
- ❖ Microsurgery AR training
Intelligent tutoring program for internal limiting membrane (ILM) peeling surgery



- ❖ HMI in VE – Remote & real-time human-robot collaboration

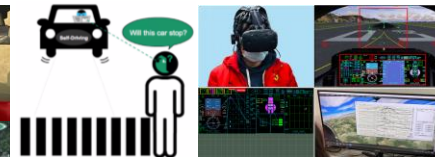
(Driving) Simulators

- 👁️ ADAS
- 👁️ Remote co-driving simulation
- 👁️ Pedestrian-driver-UAV interaction
- 👁️ Attention & vigilance
- 👁️ Glare, flicker, other lightings
- 👁️ Cockpit design



Military application

Consumer behavior & product development



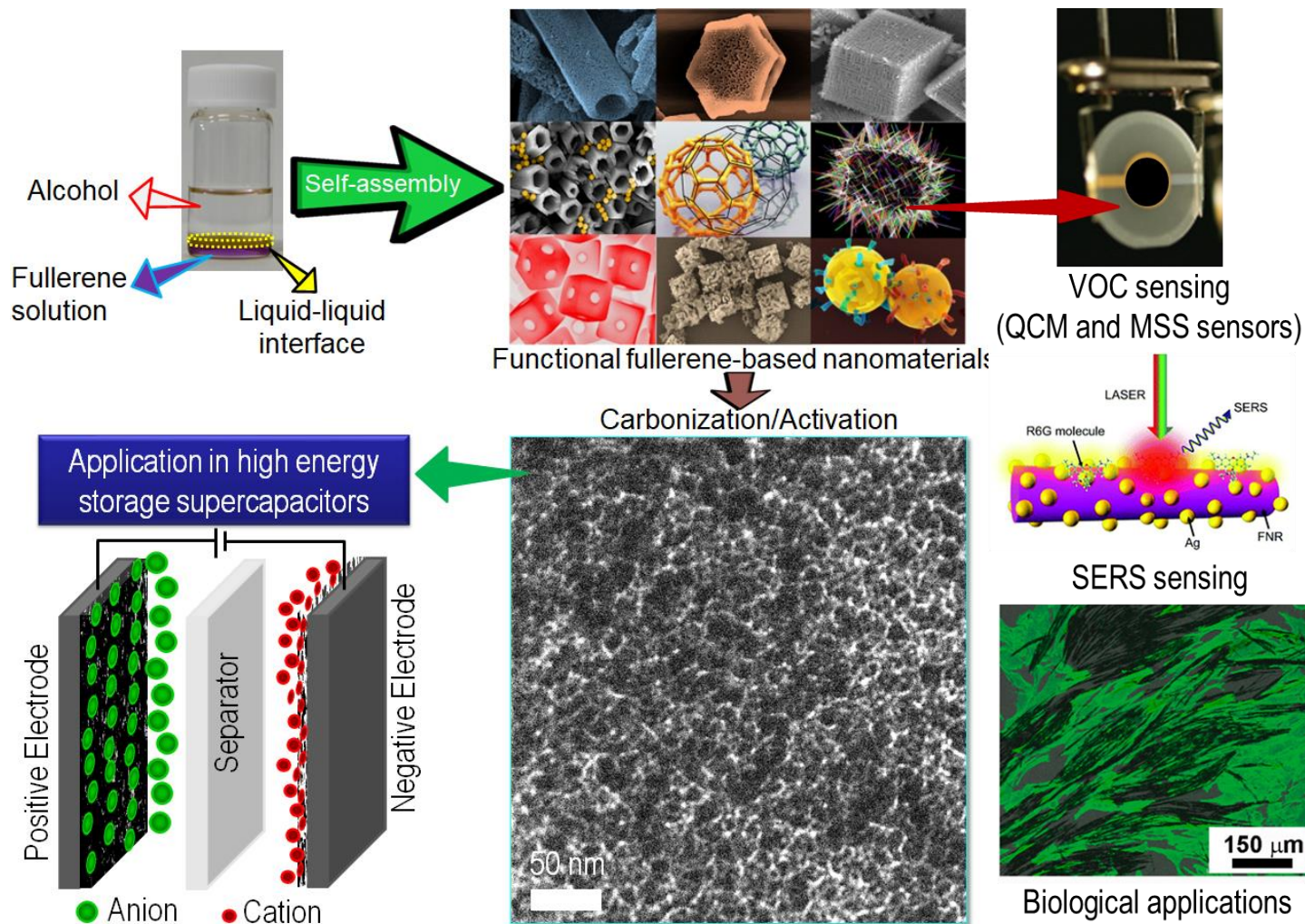
- ❖ Simulators – Driving behavior, eye tracking, HCI optimization, ...

Lok SHRESTHA

Chief Researcher

Supramolecules Group, Research Center for Materials Nanoarchitectonics (MANA)

Research Keywords: Self-assembly, Nanocarbons, Fullerenes, Nanoporous Carbons, Carbonization, Activation, Energy storage, Supercapacitors, Sensing, Biological application



Prof. Wen-Yueh YU (游文岳)

Catalysis and Surface Chemistry Lab, Dept of Chemical Engineering

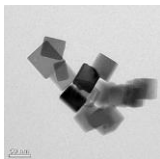
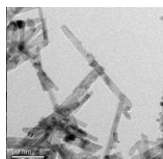
Research Keywords: heterogeneous catalysis, surface science, functional nanomaterial, sustainable process, electrocatalysis, photocatalysis



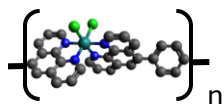
renewable/waste resources
CO₂, biomass, NO_x, plastics



metal oxide nanocrystal catalyst
surface property manipulation



metallo-supramolecular polymer
as heterogeneous catalyst



carbon nitride catalyst
metal-support interaction



upgrading

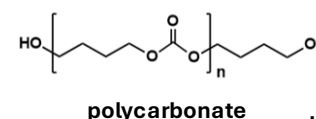
Green
Processes

Catalyst
Synthesis

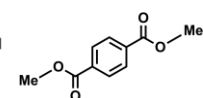
Surface
Analysis



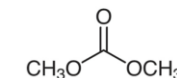
green chemicals
organic carbonate, platform chemical, NH₃, monomer



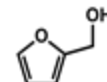
polycarbonate



dimethyl terephthalate



dimethyl carbonate

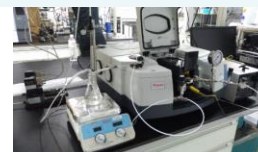


furfuryl alcohol



in-situ Raman
surface structures

in-situ IR
surface intermediate



residual gas analyzer
real-time gas monitoring



CO₂ Conversion: *Appl. Catal. B* 265 (2020) 118524; *Chem. Eng. J.* 430 (2022) 132941; *Mater. Today Sustain.* 23 (2023) 100425; *Chem. Eng. J.* 486 (2024) 150339

Biomass Upgrading: *Appl. Catal. B* 312 (2022) 121383; *Mater. Today Sustain.* 19 (2022) 100199

Electrocatalysis: *Nano Energy* 121 (2023) 109183; *Chem. Eng. J.* 497 (2024) 154145; *Chem. Eng. J.* 497 (2025) 154145; *Chem. Eng. J.* 515 (2025) 163888

Emerging Nanomaterials: *J. Catal.* 416 (2022) 222; *Surf. Interfaces* 43 (2023) 103597

Associate Prof. Hui-Hsin Hsiao(蕭惠心)

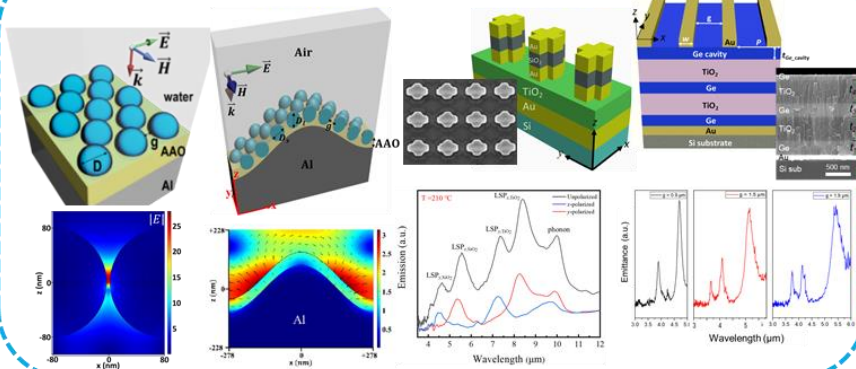
Nano-Photonics, Plasmonics & Metadevices Lab, Dept of Engineering Science and Ocean Engineering

Research Keywords: plasmonics, nanophotonics, metasurfaces, thermal emitters, nonlinear optics

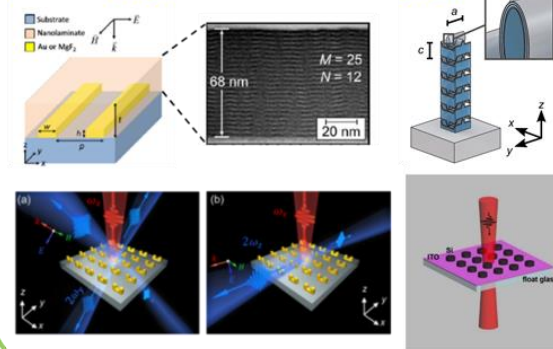


NPPM Lab

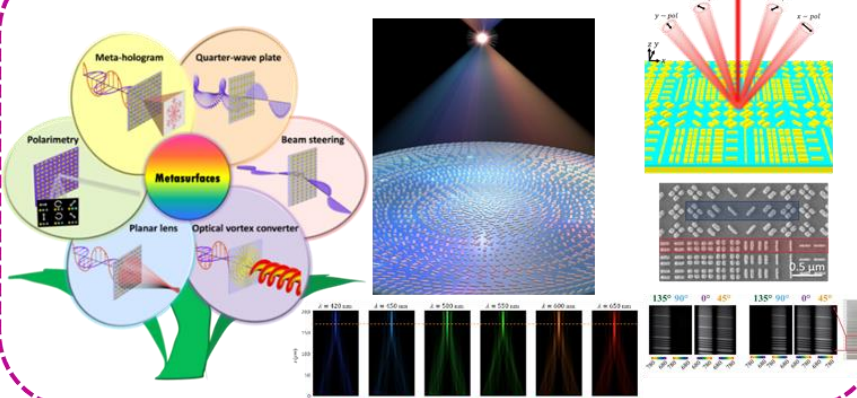
Plasmonics and applications



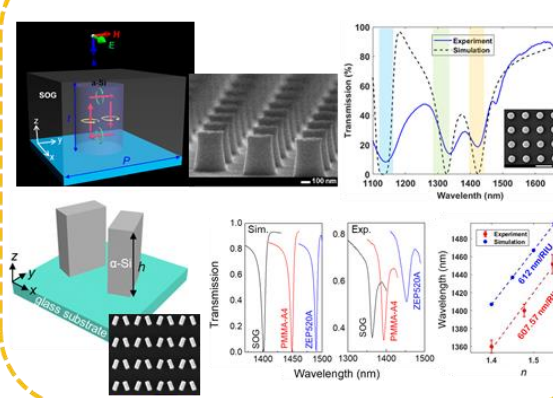
Nonlinear nano-photonics



Metasurfaces and meta-devices



All-dielectric sensors



Plasmonics: *Journal of Phys. Chem. C* 124(5), 3250–3259 (2020); *ACS Appl. Nano Mater.* 3(5), 4477–4485 (2020); *Nanotechnology* 32(16), 165201 (2021); *ACS Appl. Nano Mater.* 4(9), pp. 9344–9352 (2021); *Journal of Phys. Chem. C* 125(49), 27267–27274 (2021)

Nanophotonics: *Adv. Optical Mater.* 13(19), 2500084 (2025); *Nanophotonics* 13(17), 3155–3164 (2024); *Adv. Optical Mater.* 11(19), 2300526 (2023); *Laser Photonics Rev* 16(3), 2100404 (2022); *Adv. Optical Mater.* 10(19), 2200812 (2022)

Metasurfaces: *Adv. Sci.* 9(27), 2201227 (2022)



Takashi NAKANISHI (中西 尚志)

Group Leader

Frontier Molecules Group, Research Center for Materials Nanoarchitectonics (WPI-MANA)

Research Keywords: Functional molecular liquids/Gels/Elastomers, Alkyl- π compounds, Precise control of intermolecular interactions, Soft electronics, Energy harvesting, Luminescent materials



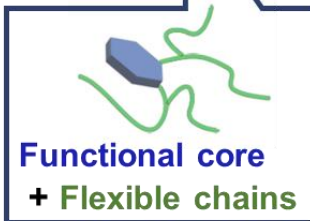
Group HP



Responsive
molecular liquids



Functional core
+ Flexible chains



Stimuli

Luminescent Color Tuning

Angew. Chem. Int. Ed. **2012**, 51, 3391.

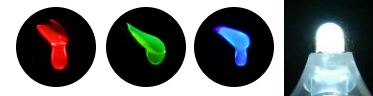
Nat. Commun. **2013**, 4, 1969.

Sci. Rep. **2017**, 7, 3416. *J. Mater. Chem. C* **2019**, 7, 2577.

Angew. Chem. Int. Ed. **2019**, 58, 9585.

Chem. Eur. J. **2025**, 31, e202500739.

Sci. Technol. Adv. Mater. **2025**, 26, 2515007.



Morphology Control / Supercooled Liquids

Nat. Chem. **2014**, 6, 690.

Chem. Sci. **2018**, 9, 6774.

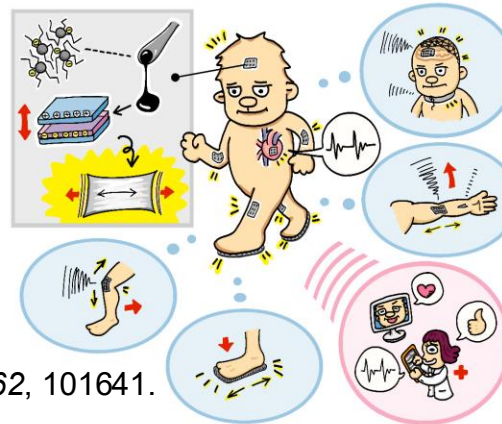
Mater. Horiz. **2020**, 7, 1421.

Chem. Eur. J. **2023**, 29, e202203775.

Helv. Chim. Acta. **2023**, 106, e202300050.



Liquid Electrets: Mechanoelectric Generators



Nat. Commun. **2019**, 10, 4210.

Polym. J. **2023**, 55, 529.

Mater. Horiz. **2023**, 10, 3458.

Angew. Chem. Int. Ed. **2024**, 63, e202402874.



Review Articles:

Chem. Commun. **2017**, 53, 10344.

Mol. Syst. Des. Eng. **2019**, 4, 78.

Adv. Opt. Mater. **2019**, 7, 1900176.

Acc. Chem. Res. **2019**, 52, 1834.

J. Mater. Chem. C **2021**, 9, 10661.

Org. Chem. **2021**, 3, 309.

Mol. Syst. Des. Eng. **2022**, 7, 537.

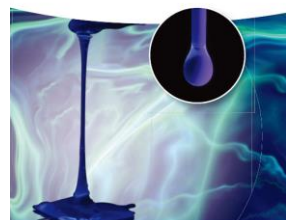
Curr. Opin. Colloid Interface Sci. **2022**, 62, 101641.

Responsive Mater. **2023**, 1, e20230001.

Edited by
Takashi Nakanishi

Functional
Organic Liquids

WILEY-VCH



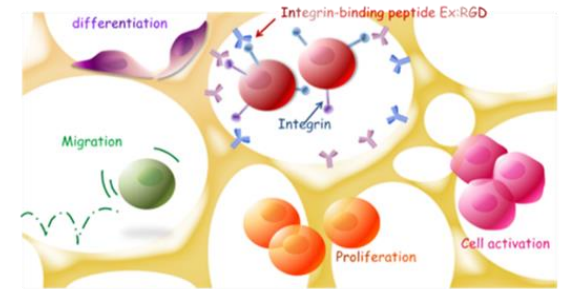


Jiashing Yu 游佳欣, Professor

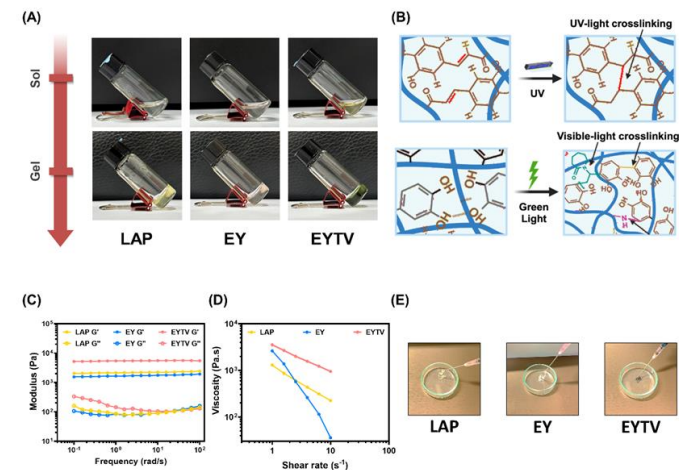
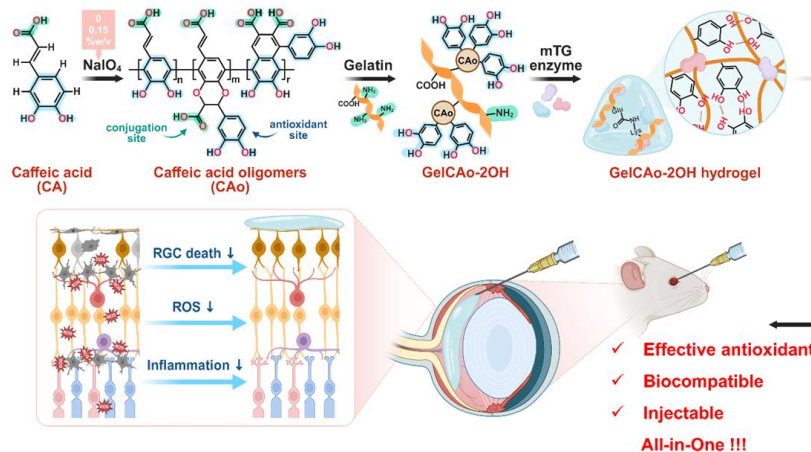
Biomaterials and Tissue Engineering Lab

**Department of Chemical Engineering,
National Taiwan University**

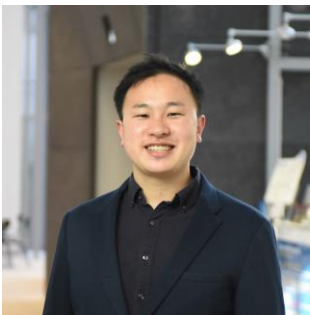
Microenvironment: Cell - Bioactive materials



1. **Biopolymer**: hydrogel, bioink synthesis, stem cells and tissue engineering. *Advanced Healthcare Materials* 2025, 01583; *Materials Today Bio* 2024, 27, 101146, *Advanced Science* 2024 (11), 2308635
2. **Nanomedicine**: polymers and liposome based DDS, photothermal and photodynamic therapy, extracellular vesicles. *Advanced Healthcare Materials* 2024 (13), 2404418, *Advanced Healthcare Materials* 2023, 12 (28), 2301504
3. **Multi-dimensions cell culture** : 3D culture, electrical and dynamic stimuli. *Biomacromolecules* 2023, 24 (8), 3858-3871, *Materials Today Bio* 2024, 29, 101333, *Journal of Materials Chemistry B* 9 2021, (37), 7674-7685



<https://orcid.org/0000-0002-0782-2328>



Mizuki TENJIMBAYASHI (天神林 瑞樹)

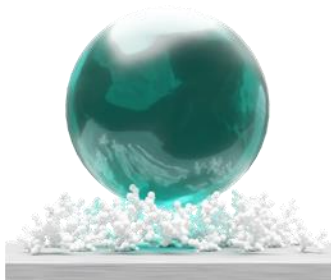
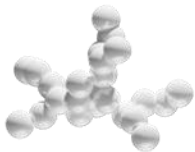
Independent Researcher

Research Center for Materials Nanoarchitectonics (WPI-MANA)

Research Keywords: Wetting dynamics, Droplet manipulation, Hydrophobic surfaces, liquid-repellent coating, liquid marbles.

Research goal: Technology for manipulating liquid without adhesion loss

Assemble onto substrate
for **liquid-repellent coating**



Food repellent container

Our review: *Science and Technology of Advanced Materials* **23**, 473 (2022)

Scale: sub to tens nm

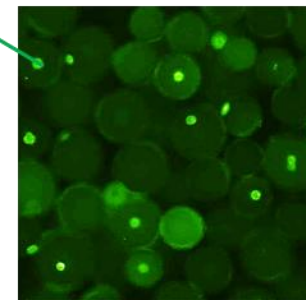


Assemble
on droplet surface
for **liquid marble**



Handling droplet

Cell inside liquid marbles



Cell culturing

Our review: *Nanoscale* **15**, 18980 (2023)

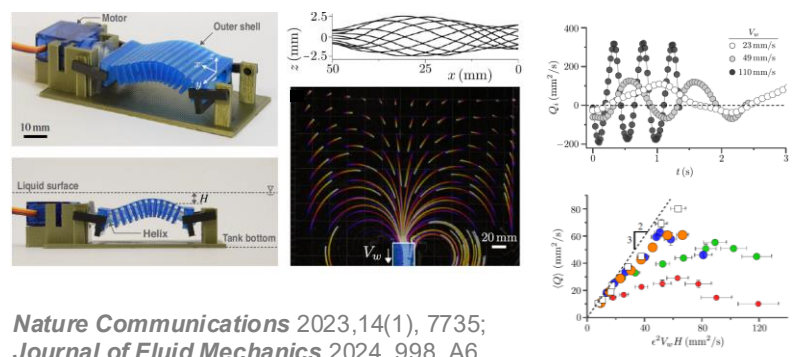


Prof. Zih-Yin Chen (陳子殷)

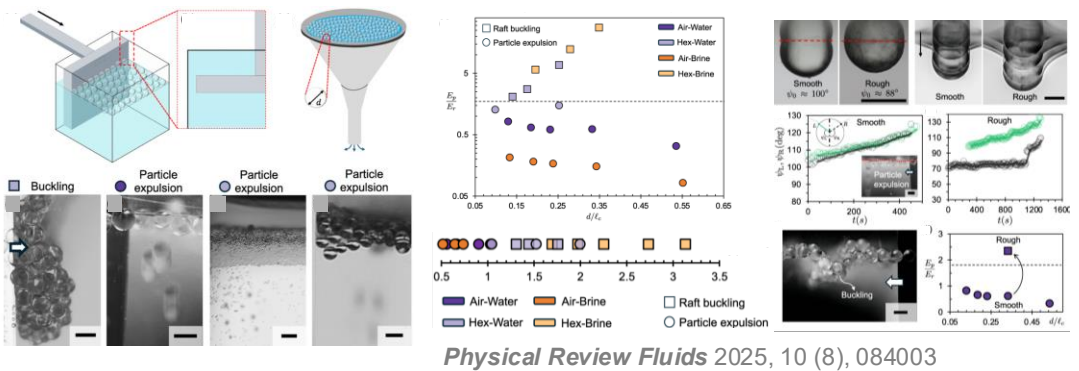
Interfacial Fluid Dynamics Lab, Dept. of Mechanical Engineering

Research Keywords: Fluid mechanics – mathematical modeling and experiments: Drops / Thin liquid film/ Particle-laden flows, particle assembly/ Low Reynolds number hydrodynamics

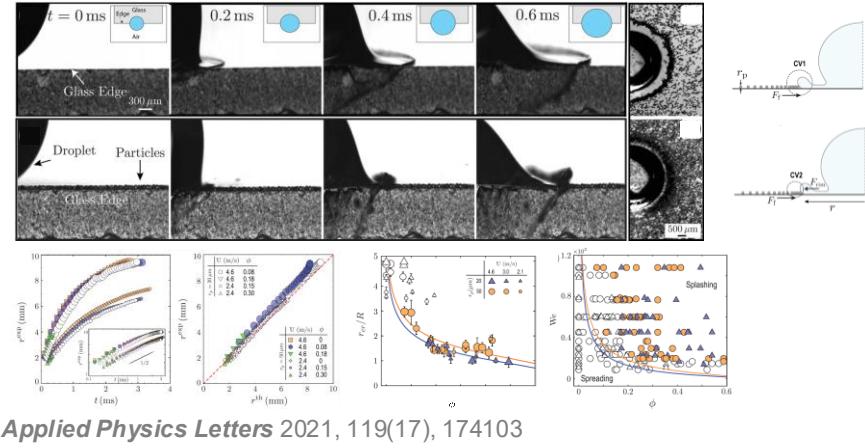
Free surface pumping



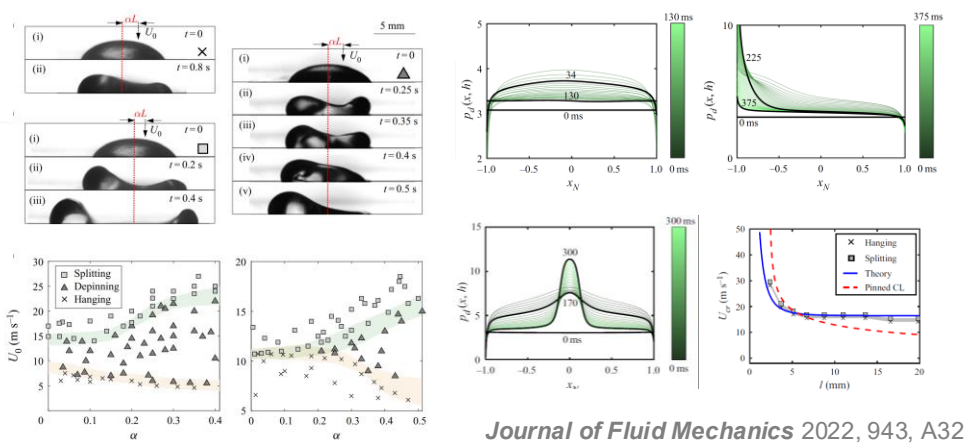
Buckling of particle-laden interfaces



Droplet impact dynamics



Droplet dynamics under airflow



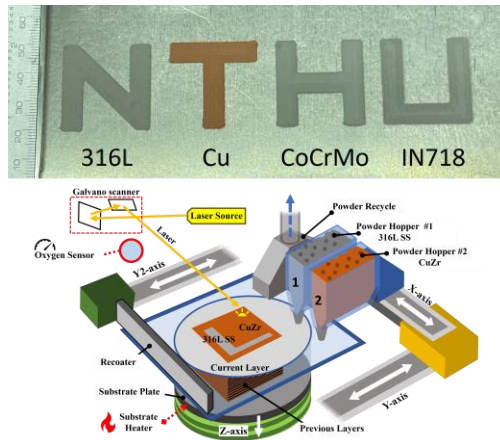
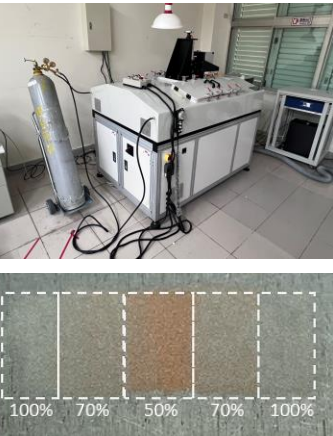


Assist Prof. Yuan-Hui Chueh (覺元彙)

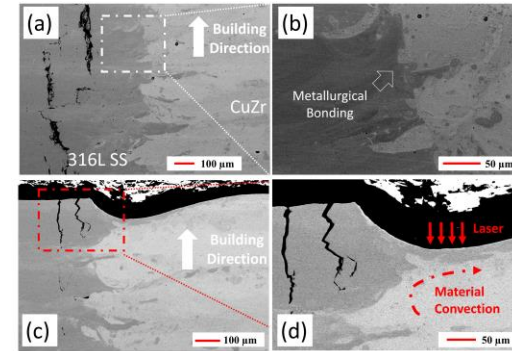
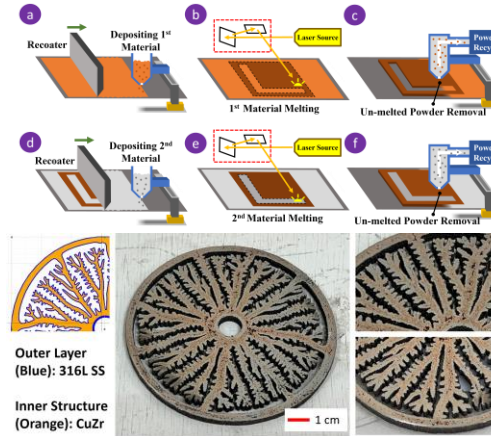
Advanced Laser Materials Processing Laboratory, Institute of Applied Mechanics

Research Keywords: Laser Material Processing, Multi-Material Additive Manufacturing, Laser Powder Bed Fusion, Heterogeneous Material Integration, Laser-Driven Multi-Physics Material Behavior, Intelligent Manufacturing and Process Optimization

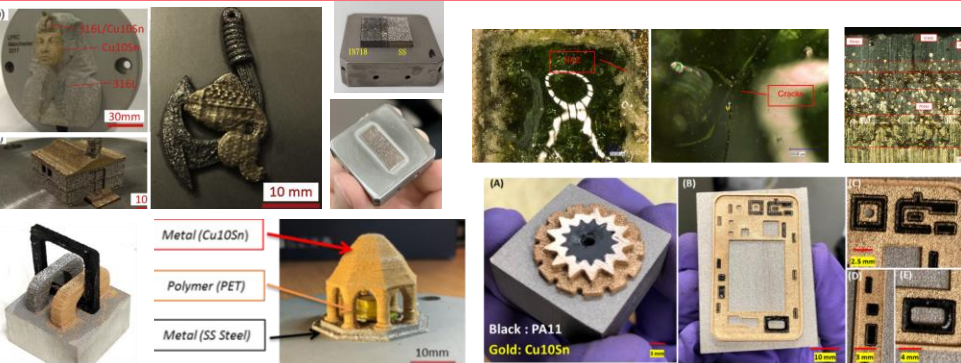
Multiple Material Laser powder bed fusion



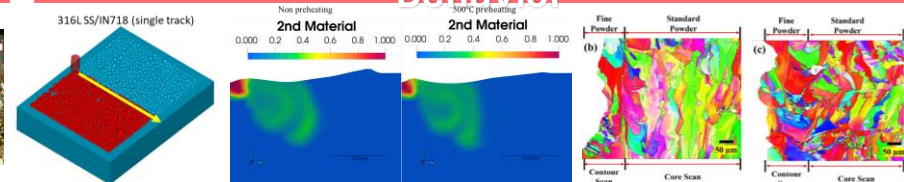
Interfacial Characteristics in Multi-Material



Multiple Material Components



Laser-Driven Multi-Physics Material Behavior



CIRP Ann. 2024, 73, 145; Addit. Manuf. 2020, 31, 100928; Addit. Manuf. 2020, 36, 101465; J. Manuf. Sci. Eng. 2020, 1–31; Addit. Manuf. 2020, 35, 101448; J. Manuf. Sci. Eng. 2019, 141, 071002; Addit. Manuf. 2021, 37, 101683; Addit. Manuf. 2019, 29, 100818; Addit. Manuf. 2020, 33, 101138; Addit. Manuf. 2020, 33, 101113; J. Manuf. Sci. Eng. 2019, 141, 1; Addit. Manuf. 2022, 49, 102481; Addit. Manuf. Technol. 2023, 185–217.



Masahiro KUSANO (草野 正大)

Senior researcher

Additive manufacturing Group, Research Center for Structural Materials

Research Keywords: Additive manufacturing, Powder bed fusion (PBF), Directed energy deposition (DED), In-process monitoring, Process simulation,

Mlab cusing R
(Concept laser)



SLM280
(SLM Solutions)



JAM-5200EBM
(JEOL)



LAMDA200
(Nidec Machine Tool)



Technique	PBF		DED
Heat source	Laser beam	Electron beam	Laser beam
Features	Complex shape products with high dimensional precision	- Preheating - Scanning speed	Fast fabrication of large parts

Additive Manufacturing Group Home page:

<https://rcsm.nims.go.jp/english/about/organization-members/materials-manufacturing-field/page000206.html>



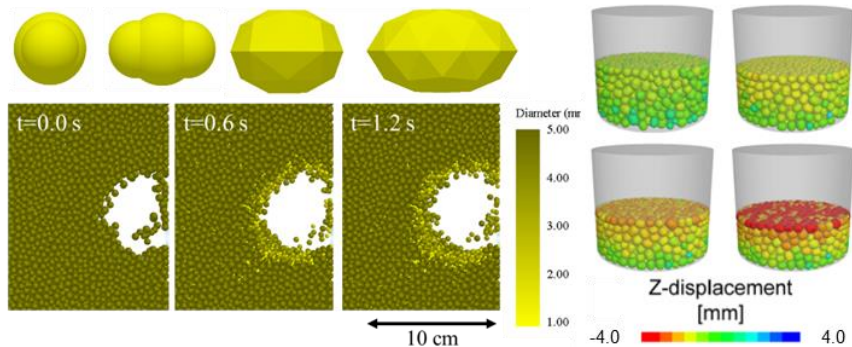
Prof. Te-Cheng Su (蘇 德徵)

Solidification Processing and Rheology Lab, Dept. of Materials Science and Engineering

Research Keywords: engineering alloys, solidification processing, intermetallics, CALPHAD, mesoscopic methods, materials characterization, particle rheology
Phase Transformation and Rheology Modeling for Metal Processing Technology



Experiment and Simulation of Semi-Solid



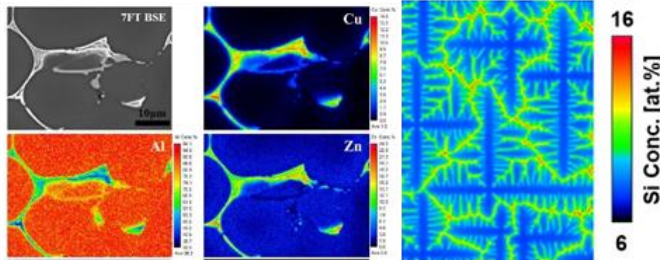
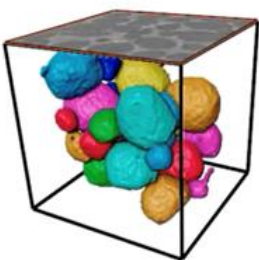
Powder Technology, 2025, 458: 120952; *Materials Processing Fundamentals* 2025, 2025, 85; *Metallurgical and Materials Transactions A*, 2023, 54.10: 3882-3896; *Solid State Phenomena*, 2022, 327: 127-132; *Acta Materialia*, 2020, 191: 24-42.

Metal Solidification Microstructure and IMCs

Globular Crystals
(X-ray Tomography)

Eutectics and Intermetallics
(Elemental Mapping)

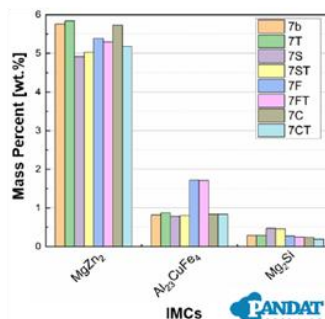
Microsegregation
(Phase-Field Method)



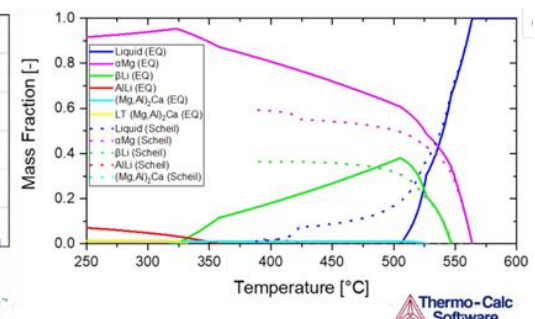
Materials Today Communications, 2025, 47: 113029; *Light Metals* 2025, 2025, 205; *Materials Characterization*, 2024, 214: 114088; *Metallurgical and Materials Transactions A*, 2021, 52.5: 2010-2023; *JOM*, 2019, 71.7: 2235-2244; *Acta Materialia*, 2019, 163: 208-225.

Calculation of Phase Diagrams

Intermetallics in 7075 Aluminum Alloys

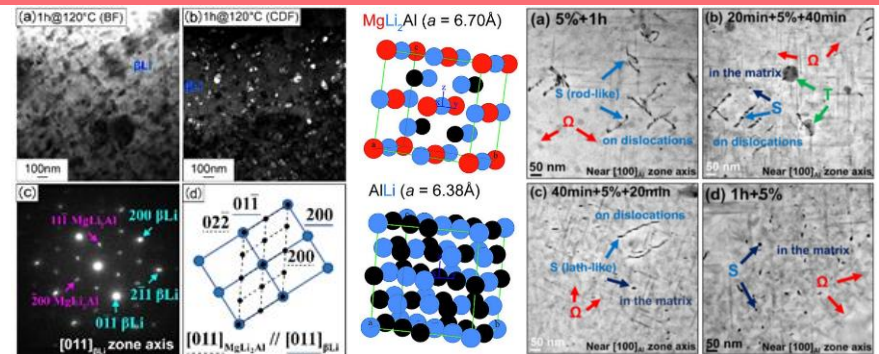


Solidification of LAZ771+Ca Magnesium Alloy



Materials Science and Engineering: A, 2025, 931: 148157; *Materials Characterization*, 2024, 214: 114091; *Metals*, 2023, 14.1: 15; *Solid State Phenomena*, 2023, 347: 11-16; *Journal of Alloys and Compounds*, 2021, 867: 159031.

Nanoscale Characterizations for Alloys



Materials Characterization, 2025, 115465; *Materials Characterization*, 2025, 114814; *Materials Science and Engineering: A*, 2025, 147648; *Materials Science and Engineering: A*, 2024, 146254; *Materials Science and Engineering: A*, 2023, 145361.



National Institute for Materials Science (NIMS)

participants list in 2024



Yutaka Wakayama (若山 裕)

Group Leader,
Semiconductor Functional Device Group,
Research Center for Materials Nanoarchitectonics (MANA)



Yusuke Ide (井出 裕介)

Group Leader,
Layered Nanochemistry Group,
Research Center for Materials Nanoarchitectonics (MANA)

Research Keywords: Layered silicate, layered titanate, iron oxo-oligomer, UV shielding, (photo)catalysis, adsorption



Yu Yamashita (山下 侑)

Senior Researcher,
Supermolecules Group,
Research Center for Materials Nanoarchitectonics (MANA)

Research Keywords: organic semiconductor, redox reaction, doping, diodes



Ryoma Hayakawa (早川 竜馬)

Principal Researcher,
Semiconductor Functional Device Group,
Research Center for Materials Nanoarchitectonics (MANA)

Research Keywords: Antiambipolar transistors, Heterojunction transistors, Multivalued logic-in-memory



Takaaki Taniguchi (谷口 貴章)

Principal Researcher,
Functional Nanomaterials Group,
Research Center for Materials Nanoarchitectonics (MANA)

Research Keywords: 2D nanomaterials, soft-chemistry, nanosheets, graphene oxide, functional coatings, catalysts



Tohru Tsuruoka (鶴岡 徹)

Chief Researcher,
Ionic Device Group,
Research Center for Materials Nanoarchitectonics (MANA)

Research Keywords: Nano-ionics, Memory, Artificial nueromorphics



Junko Aimi (相見 順子)

Senior Researcher,
Molecular Mechatronics Group,
Research Center for Macromolecules and Biomaterials

Research Keywords: Precision polymer synthesis, supramolecular chemistry, organic field effect transistor memory



Ryota Tamate (玉手 亮多)

Independent Scientist,
Research Center for Macromolecules and Biomaterials

Research Keywords: Functional polymer, polymer gel, ionic liquid, gel electrolyte, self-healing, lithium secondary battery



Koichiro Uto (宇都 甲一郎)

Principal Researcher,
Smart Polymers Group,
Research Center for Macromolecules and Biomaterials

Research Keywords: Shape memory polymer, 4D printing, Materiobiology, Biomedical application



Takeshi Ueki (上木 岳士)

Principal Researcher,
Mechanobiology Group,
Research Center for Macromolecules and Biomaterials

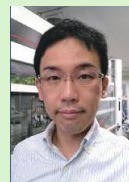
Research Keywords: Ionic liquids, gels, stimuli-responsive polymer, block copolymers, radical polymerization, mechanobiology



Sadaki Samitsu (佐光 貞樹)

Principal Researcher,
Data-driven Polymer Design Group,
Research Center for Macromolecules and Biomaterials

Research Keywords: Porous materials, polymer physics, X-ray CT



Yasuyuki Nakamura (中村 泰之)

Senior Researcher,
Data-driven Polymer Design Group,
Research Center for Macromolecules and Biomaterials

Research Keywords: Adaptive polymers, Polymer synthesis, Disulfide bonding



National Taiwan University participants list in 2024

2024 Spring



Prof. Cheng-Liang Liu (劉振良)

Dept. of Materials Science and Engineering

Research Keywords: Electronic and optoelectronic polymer, organic thermoelectric, organic electronics, solution-processing, field effect transistor, solar cell



Prof. Yi-Chia Chou (周政嘉)

Dept. of Materials Science & Engineering

Research Keywords: microstructure, low dimensional materials, crystal growth, compound semiconductors, electron microscopy



Prof. Hung-Wei YEN (顏鴻威)

Dept. of Materials Science & Engineering

Research Keywords: microstructure, crystal defect, mechanical property, steel, light metal, high-entropy alloy, electron microscopy, atom probe tomography



Prof. Chu-Chen Chueh (闕居振)

Dept. of Chemical Engineering

Research Keywords: Organic and perovskite semiconductors & optoelectronic devices (transistors, solar cells, and light-emitting diodes)



Prof. Wen-Yueh YU (游文岳)

Dept. of Chemical Engineering

Research Keywords: heterogeneous catalysis, surface science, functional nanomaterial, sustainable process, electrocatalysis, photocatalysis



Prof. Jiasheng Yu (游佳欣)

Dept. of Chemical Engineering

Research Keywords: biopolymer: hydrogel, biotink synthesis, stem cells and tissue engineering, nanomedicine, extracellular vesicles, 3D cell culture



Prof. I-Chung Cheng (鄭憶中)

Dept. of Mechanical Engineering

Research Keywords: dealloying kinetic, metal foams, energy absorption, machine learning-genetic algorithm, CO₂ reduction, SERS



Prof. Chien-Hao Liu (劉建豪)

Dept. of Mechanical Engineering

Research Keywords: Microwave circuit and frequency selective surfaces, simulations of quasi-2D heterojunction oxide transistor, bone-guided electronic cochlear



Prof. Dian-Ru Li (李典如)

Dept. of Mechanical Engineering

Research Keywords: Additive Manufacturing, Process Control, Smart Manufacturing, Biomanufacturing, Biomedical Engineering, Medical Device Development



Prof. Chia-Ching Chou (周佳靚)

Institute of Applied Mechanics

Research Keywords: multiscale modeling, computational mechanics, biological materials, hydrogel, bio-inspired materials, machine learning, clinical decision support



2024 Fall



Prof. Chun-Wei Chen (陳俊維)

Dept. of Materials Science & Engineering

Research Keywords: Two-dimensional (2D) materials for electronics and energy conversion, 2D/3D Organic-inorganic halide perovskites, Novel energy materials



Prof. Dun-Yen Kang (康敦彥)

Dept. of Chemical Engineering

Research Keywords: Metal-organic framework, MOF membrane, Membrane gas separation, CO₂ capture



Prof. Li-Chiang Lin (林立強)

Dept. of Chemical Engineering

Research Keywords: Nanoporous Materials, Adsorption, Separation, Molecular Simulations, Machine Learning



Prof. Ya-Yu Chiang (蔣雅郁)

Dept. of Mechanical Engineering

Research Keywords: Flow chemistry, Two-phase flow, Microreactor, Micro-Gravity



Prof. Hsin-Tien Lin (林心恬)

Dept. of Mechanical Engineering

Research Keywords: Life cycle assessment, Material flow analysis, circular economy, eco-design, energy transition



Prof. Hui-Hsin Hsiao (蕭惠心)

Dept. of Ocean Engineering

Research Keywords: Plasmonics, nanophotonics, metasurfaces, thermal emitters, nonlinear optics



Prof. Shu-Wei Chang (張書瑋)

Dept. of Civil Engineering

Research Keywords: Computational Mechanics, Computational Materials, Biomechanics, Mechanobiology, Atomic Scale Modeling, Multi-scale/Multi-physics Modeling



Prof. Chien-Fu Chen (陳建甫)

Institute of Applied Mechanics

Research Keywords: Lab on a chip, Microfluidics, Disease diagnosis device, sensor