關肇正 Dr. Chao-Cheng Kaun
Research Fellow

- Computational nanoelectronics and spintronics
- Emerging energy materials

林時彥 Dr. Shih-Yen Lin
Research Fellow

- Material Growth and Device Applications of 2-D Crystals
- Molecular Beam Epitaxy, Optoelectronic Devices

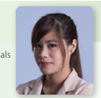
張書維 Dr. Shu-Wei Chang
Associate Research Fellow

- Semiconductor pasmonic nanolasers
- Group IV silicon-germanium-tin active photonic devices

陳　祺 Dr. Chi Chen
Associate Research Fellow

- Near-field optical microscopy
- Atomic force microscopy
- Low-dimensional materials and mesoscopic assembly

呂宥蓉 Dr. Yu-Jung Lu
Associate Research Fellow



- Plasmonics, nanophotonics, and metamaterials
- Green photonics; Ultrafast charge-carrier dynamics
- Plasmonic transition metal nitrides

郭志禹 Dr. Chih-Yu Kuo
Research Fellow

- Slope stability monitoring, failure surface analysis and inversion
- Debris flow, fluid mechanics and acoustics

包淳偉 Dr. Chun-Wei Pao
Research Fellow

- Atomistic scale simulation of surface and bulk diffusion
- Mechanical properties of nanomaterials

張允崇 Dr. Yun-Chorng Chang
Associate Research Fellow

- Nanophotonics and Plasmonics
- Nanofabrication

程育人 Dr. Yuh-Jen Cheng
Associate Research Fellow

- Low dimension material growth and device physics
- Water splitting, electrocatalysis, green energy technology

方牧懷 Dr. Mu-Huai Fang
Assistant Research Fellow

- Luminescent Materials
- Optoelectronic Materials
- Battery-used Materials

Quantum Photonics 量子光電

張文豪 Dr. Wen-Hao Chang
Acting Executive Officer of the TCQP / Distinguished Research Fellow

- 2D materials: synthesis, physics and devices
- Quantum light sources

陳俞辰 Dr. Yu-Chen Chen
Assistant Research Fellow

- Fabrication and femtosecond laser writing of spin defects in wide band gap materials
- Manipulation of the spin states

Quantum Computer 量子電腦

陳啟東 Dr. Chii-Dong Chen
Acting Executive Officer of the TCQC / Research Fellow

- Design, fabrication and operation of superconducting qubits
- Transport properties of nano electronics

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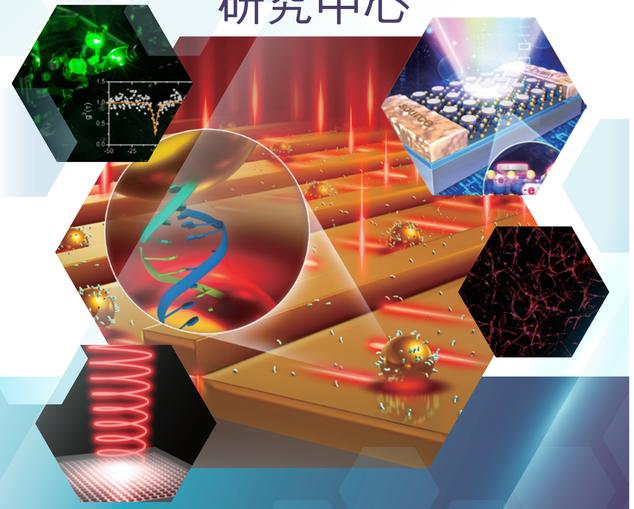
應用科學
研究中心



Research Center for Applied Sciences
Academia Sinica Taiwan

中央研究院

Bio & Medical Application 生醫科學應用

陳培菱 Dr. Peilin Chen
Acting Executive Officer of the TCBMA / Research Fellow

- Real-time intravital imaging
- Development of microfluidic and biosenors

魏培坤 Dr. Pei-Kuen Wei
Director / Research Fellow

- Nano-Plasmonics and Biomedical Applications
- Nanofabrication and Biochips

楊富量 Dr. Fu-Liang Yang
Distinguished Research Fellow

- Wearable Device, Pulsation Waveform Characterization and Modulation
- Noninvasive Blood Glucose Measurements via AI Deduction Learning

鄭郅言 Dr. Ji-Yen Cheng
Deputy Director / Research Fellow

- Nucleic acid and protein biosensors
- Microfluidic device development and applications
- Cell-based microalaysis, electrotaxis

李超煌 Dr. Chau-Hwang Lee
Research Fellow

- Optical microscopy and imaging technology
- 3D cell-microenvironment interactions

林榮信 Dr. Jung-Hsin Lin
Research Fellow

- Pharmacoinformatics
- Computational Biophysics
- Structural Biology
- Intelligence Biomedicine

薛景中 Dr. Jing-Jong Shyue
Research Fellow

- Microcharacterization (surface analysis, transmission electron microscopy)
- Functional materials (for electronic, chemical, and biomedical applications)

董奕鍾 Dr. Yi-Chung Tung
Research Fellow

- Integrated Biomedical Microdevices for Point-of-Care
- Cell Behavior Study in Various Micro-Environments

陳壁彰 Dr. Bi-Chang Chen
Associate Research Fellow

- Bessel Beam Plane Illumination Microscopy
- Lattice Light Sheet Microscopy

林鈺容 Dr. Yu-Jung Lin
Assistant Research Fellow

- Development of drug delivery systems
- Therapeutic gas-generating systems

謝東翰 Dr. Tung-Han Hsieh
Research Specialist

- HPC design and maintenance
- Computational Physics
- Machine Learning

謝書宜 Dr. Shu-Yi Hsieh
Assistant Research Specialist

- Organic synthesis
- Nanoparticle synthesis
- Applications of sensor

Green Technology 綠色科技

朱治偉 Dr. Chih Wei Chu
Acting Executive Officer of the TCGT / Research Fellow

- Flexible electronics
- Emerging energy devices

施閔雄 Dr. Min-Hsiung Shih
Deputy Director / Research Fellow

- Nanophotonic and plasmonic devices
- Two-dimensional materials

RCAS Introduction 中心簡介

Mission

For carrying out the interdisciplinary applied science research with strong cooperation inside and outside the Academia Sinica.

RCAS has four thematic centers: Bio & Medical Application, Green Technology, Quantum Photonics, and Quantum Computer.

Partnerships

- Chang Gung University
- National Dong Hwa University
- Hokkaido University
- National Sun Yat-Sen University
- The Hebrew University of Jerusalem
- National Cheng Kung University
- National Taiwan University
- National Yang-Ming Chiao-Tung University
- National Tsing Hua University

Academic Advisory Committee (2023.1.1~2025.12.31)

牟中原 院士
Prof. Chung-Yuan Mou (Chair)
- Professor Emeritus, Distinguished Chair Professor for Research, Department of Chemistry, National Taiwan University, Taiwan

林麗瓊 院士
Prof. Li-Chyong Chen
- Distinguished Research Fellow, Center for Condensed Matter Sciences, National Taiwan University, Taiwan

江台章 院士
Prof. Tai Chang Chiang
- Research Professor, Department of Physics, University of Illinois, USA

Prof. Hiroaki MISAWA
- (Specially Appointed) Professor, RIES – Research Institute for Electronic Science, Hokkaido University, Japan

戴聿昌 院士
Prof. Yu-Chong Tai
- Anna L. Rosen Professor of Electrical Engineering and Mechanical Engineering, California Institute of Technology (Caltech), USA

Prof. Nai-Chang Yeh
- Professor of Physics, California Institute of Technology (Caltech), USA

Prof. Jackie Y. Ying
- A*STAR Senior Fellow, NanoBio Lab, Institute of Materials Research and Engineering, Agency for Science, Technology and Research, Singapore

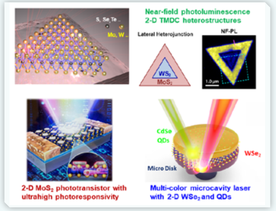
Green Technology 綠色科技

Thematic Center for Green Technology

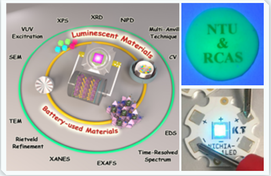
The objective of this thematic center is to explore innovative manufacturing and emerging materials in order to expedite the development and implementation of sustainability technologies: The key research interests include: (1) Advanced Materials and Nanofabrications, (2) Energy-Efficient and Renewable Energy Generation Devices, and Energy Storages, (3) Nanophotonic Devices. Currently, the thematic center comprises 12 principal investigators (PIs): Shu-Wei Chang, Yun-Chorng Chang, Chi Chen, Yuh-Jen Cheng, Chih Wei Chu, Chao-Cheng Kaun, Shih-Yen Lin, Yu-Jung Lu, Min-Hsiung Shih, Chun-Wei Pao, Chih-Yu Kuo, and Mu-Huai Fang.

Focusing Project

We are performing two focusing projects in this thematic center:
The First focusing direction is to study two-dimensional materials for ultra-thin, high efficient optoelectronics. The epitaxial growth techniques for the wafer-scale, high quality 2-D materials such as graphene, (TMDCs) and related heterostructures are well established and developed in RCAS. Beside the fundamental studies on the new material properties, the PIs in RCAS are also working on the novel optoelectronic devices with 2-D semiconductors such as LEDs, lasers and phototransistors.

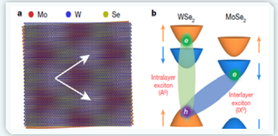


The second focusing project is on the development of battery-used materials and luminescent materials. The PIs in RCAS are working on the solid-state battery, flexible solar cells, and light-emitting diodes with novel perovskite materials.

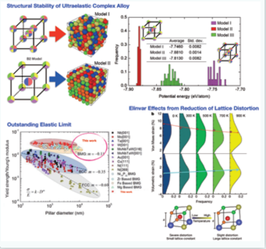


Research Achievements

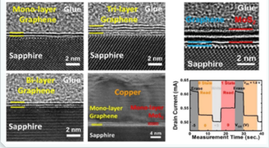
Signatures of Moire trions inWSe2/MoSe2 heterobilayers (*Nature* 594, 46–50 (2021))
We report significant coupling between trions and Moiré potential of Moiré superlattices in TMDCs. These findings will facilitate the future development for probing many-body phenomena and quantum device applications.



New opportunity from microscale ordering under high entropy: ultra-elastic high entropy Elinvar alloy (Nature 602, 251–257 (2022))
By performing a series of large-scale density functional theory calculations, we successfully reveal the atomistic structure of $Co_xNi_xHfTiZr_{2-2x}$ chemically complex alloy. The large atomic size mismatch of 11% could be accommodated by judicious arrangement of atomic sites. Our atomistic simulations indicate that the large atomic size misfit and induced strong lattice distortion (9%) are responsible for the outstanding elastic limit as well as the Elinvar effects of this complex alloy.



Two dimensional (2D) material for next-generation memory technologies
We have demonstrated that through sequential CVD growth cycles, wafer-scale and uniform graphene films can be grown layer-by-layer on sapphire substrates. By using mono-layer MoS_2 and mono-layer graphene as the liner/barrier stacks, nanometer Cu films with record-low resistivity can be grown on MoS_2 surfaces. By using MoS_2 as the charge storage and graphene as the channel layers, the first all 2D material memories, which exhibit long retention and high operation cycles, are demonstrated through the use of a top-gate transistor architecture.

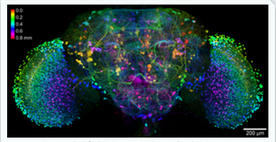


Bio & Medical Application 生醫科學應用

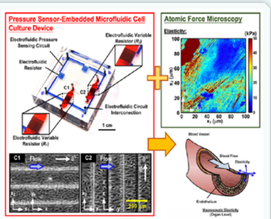
The mission of thematic center for biomedical applications is to advance biomedical applications through the development of innovative sensing, imaging, characterization, and fabrication technologies. Our focus is on topics that have the potential for industrial value in biotechnology or high-impact clinical applications. The center is comprised of ten principal investigators (PIs): Bi-Chang Chen, Peilin Chen, Ji-Yen Cheng, Chau-Hwang Lee, Jung-Hsin Lin, Yu-Jung Lin, Jing-Jong Shyue, Yi-Chung Tung, Pei-Kuen Wei, and Fu-Liang Yang, as well as two research specialists, Tung-Han Hsieh and Shu-Yi Hsieh. Collaboration with the research institutes of the Life Science Division in Academia Sinica and medical institutes of universities in Taiwan is a key aspect of this thematic center.

The major research fields of this thematic center include: 1) the development of ultra-resolution microscopic and spectroscopic tools to investigate the chemistry, physics, mechanics, and genetics in cells and cell-cell microenvironment interactions; 2) the fabrication of nano-biosensors and nanoparticles for drug delivery or labeling; and 3) the study of intelligent computation for bio-molecular interactions and biomedical applications.

To encourage collaboration between PIs, we have established several focusing projects that serve as seed funds to exchange ideas, refine thinking, and demonstrate preliminary results for applying integrated projects both in Academia Sinica and the National Council of Science and Technology. With the support of focusing project, several integrated projects were funded including the development of nanoforce sensors for drug screening, a microRNA detection system for diagnosis, and cellular memory devices. Additionally, we are conducting several pilot projects in spatial biology as a new direction of this thematic center, such as the development of expansion microscopy for large samples, single-cell analysis systems using integrated microfluidic devices and 3D cellular imaging using focused ion beam scanning electron microscopy (FIB/SEM).

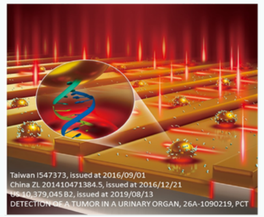


4x expanded fly brain imaging by confocal microscopy

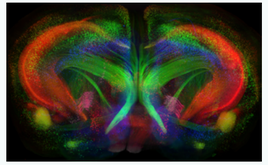


An integrated approach combining microfluidic devices and biological atomic force microscopy (Bio-AFM) has been utilized to characterize anisotropic elasticities of endothelia with and without fluidic shear stress application.

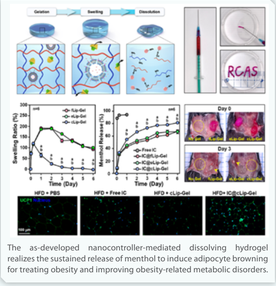
Detection of Urinary MiRNA Biomarkers



We have developed a low-cost, high-sensitivity, high-specificity, and multiplex microfluidic nanoplasmonic optical sensing technology for a universal molecular diagnostic testing platform.



Cleared Thy1-eYFP mouse brain imaged by lightsheet microscopy

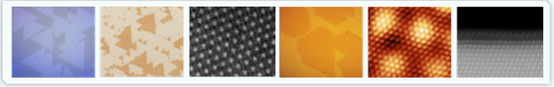


The as-developed nanocontroller-mediated dissolving hydrogel realizes the sustained release of menthol to induce adipocyte browning for treating obesity and improving obesity-related metabolic disorders.

Quantum Photonics 量子光電

The main objective of the Thematic Center of Quantum Photonics is to develop optoelectronic technologies and key components for applications in quantum technology, which are still subject to many technological constraints. We will take advantage of existing research strengths in optoelectronic materials, measurement technologies, component manufacturing processes, and theoretical analysis; extend cooperation with leading research teams in related fields both at home and abroad, and actively recruit outstanding research talents to overcome the technical barrier of key components through fundamental research and lay the foundation for quantum communication technology.

The Thematic Center hopes to develop new material growth technologies for the development of single-photon emitters, single-photon receivers, quantum optoelectronic chips and other key components required for quantum information technology as a means to lay foundation for future quantum technologies. We hope to have a significant impact on quantum computing, cryptography, imaging, sensing, data storage, and many other technologies.



Quantum Computer 量子電腦

Our goal is to design a programmable and scalable quantum computer using solid-state chips. To achieve this, we will collaborate with industry, government, academia, and research institutions to develop superconducting quantum bit chips, as well as subsystems for measurements, including hardware (low-temperature amplifiers, RF circuits, high-speed digital instruments, etc.), firmware, and programming. The resulting quantum computer platform will allow users to test algorithms. Scientists and engineers from both domestic and international organizations interested in quantum computer development are invited to participate.

Our thematic center places a strong emphasis on developing high-quality quantum chips and high-performance digital instruments for quantum computers. These technologies will be licensed to device and instrumentation manufacturers to facilitate their entry into the quantum computer market.

In the short and midterm, we aim to enhance the quality of quantum bit manipulation and readout fidelity while creating prototypes for general-purpose quantum computing. These prototypes will have practical applications in small molecule simulation.