國立臺灣師範大學
NATIONAL TAIWAN NORMAL UNIVERSITY

化學系

Department of Chemistry

Elise Li
Professor and Chair

2024.10.16

DEPARTMENT OF CHEMISTRY in NTNU

Bachelor's Program - Founded in 1962

Master's Program – Founded in 1974
PhD Program – Founded in 1989

FACULTIES : 22 + 1
(Assistant Prof. & above)

Staffs : 19
(Lecturers, Secretaries, TA, Technicians)

STUDENTS PER YEAR (2023)

UNDERGRADE : 80
MASTER : 88
PhD : 6 (+1 international)

CURRENTLY TOTAL STUDENTS (2024 Spring)

UNDERGRADE : 303 (male 185, female 118)
MASTER : 173 (male 91, female 82)
PhD : 29 (male 20, female 9)
Post Doc. : 15 (International 8)

Funding Size of Dept. Chemistry in NTNU

NSTC 國家科學及技術委員會
National Science and Technology Council

Year	Source	Number of Projects	Funding (in USD)
2017	NSTC	24	$1.79M
	Others	6	$0.64M
2018	NSTC	23	$1.75M
	Others	8	$0.98M
2019	NSTC	26	$2.40M
	Others	11	$1.06M
2020	NSTC	22	$2.14M
	Others	8	$0.82M
2021	NSTC	24	$2.00M
	Others	10	$0.80M

Active faculty number : 22 ~ 26

2019-2023 Scopus Journal Publications

Journal & Conference papers

Department of Chemistry
2019-2023
Total Scopus papers: 335
Total Citations: 5,707

Avg. Citation: 17.03

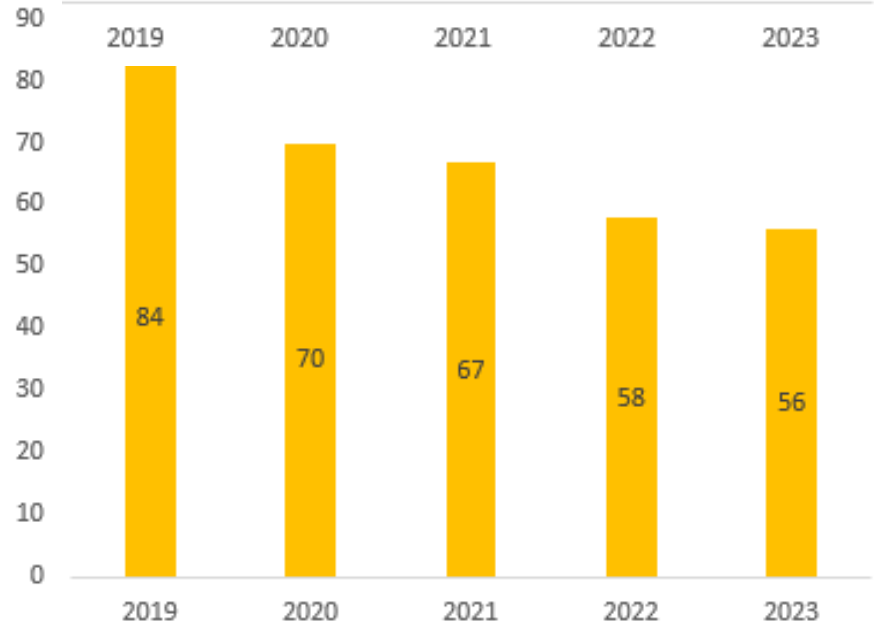
Active faculty number : 22 ~ 24

*Numbers of 2023

NTNU

College Sci

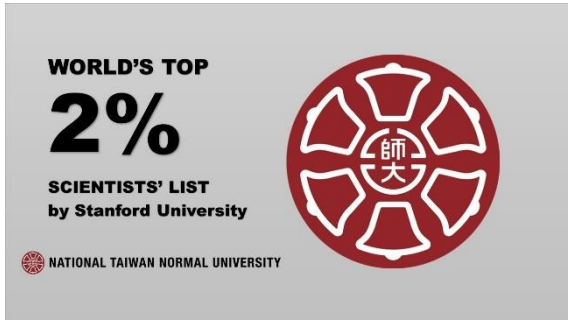
Chem. Dept.



Physical Chemistry

Chia-Chun Jay Chen, Research Chair Professor

Nanoparticle as Molecular Imaging
Nanomaterials in Energy and Optoelectronic



Jen-Han Wang, Outstanding Professor

Surface and material chemistry

Elise Yu-Tzu Li, Distinguished Professor & Chair

Computational Chemistry,
Electronic Structure Theory,
Quantum Conduction,

I-Ren Lee, Associate Professor

Single Molecule Fluorescence Resonance Energy Transfer, smFRET
Optical Tweezers for Biomolecules : DNA, Proteins

Di-Yan Wang, Distinguished Professor

Electrochemical catalysis for Hydrogen and Oxygen Evolution Reaction, CO_2 and O_2 Reduction Reaction, Al ion battery

Department of Chemistry

Single-molecule DNA Structural Dynamics

My research interest mainly focus on the structural dynamics of tandem repeat DNA sequences associated with neurodegenerative diseases. Hairpins formed by these repeats interrupt protein machineries and lead to the abnormal gene expansions that ultimately result in incurable genetic disorders. With single-molecule fluorescence resonance energy transfer spectroscopy, we found that these hairpins are highly dynamic with parity dependence and undergo slippage reconfigurations, which may play a crucial role in abnormal gene expansion.

Techniques used in study

Single-molecule Total Internal Reflection Microscopy;
Circular Dichroism Spectroscopy;
Force Microscopy.

I-Ren Lee, Assistant Professor
Department of Chemistry
irenlee@ntnu.edu.tw

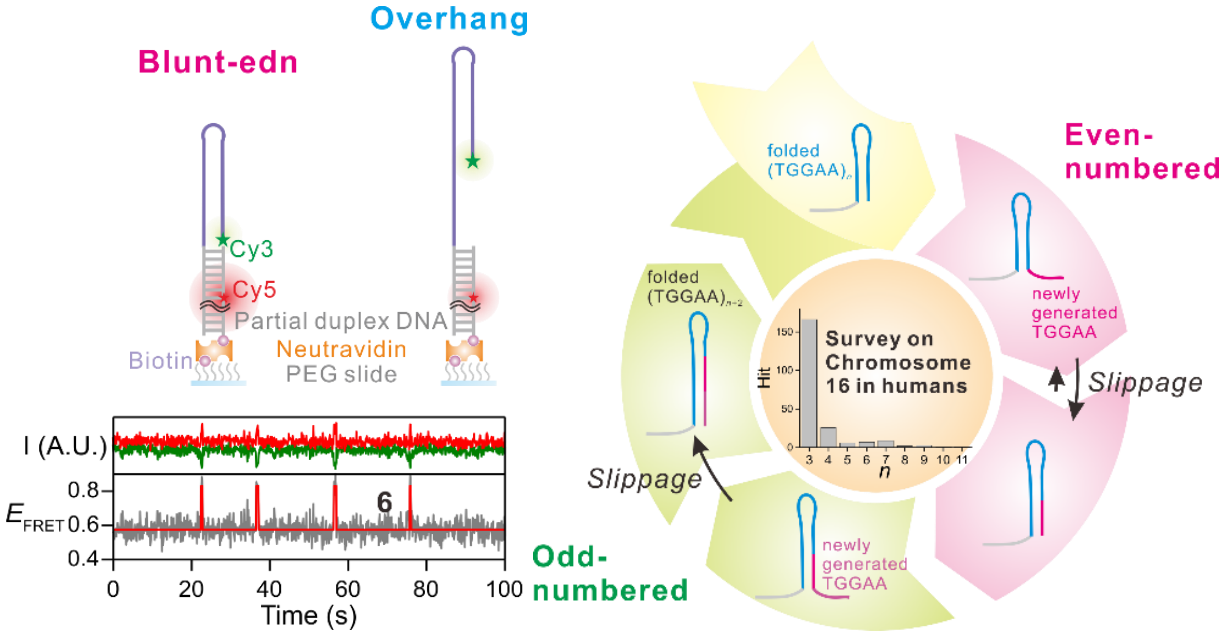
Backbround:

PhD in Chemistry,
California Institute of Technology.
Postdoctoral Research Fellow,
University of Illinois at Urbana-Champaign.

Funding:

Ministry of Science and Technology

Hairpin Slippage Reconfiguration Revealed by Single-molecule Fluorescence Resonance Energy Transfer Spectroscopy.



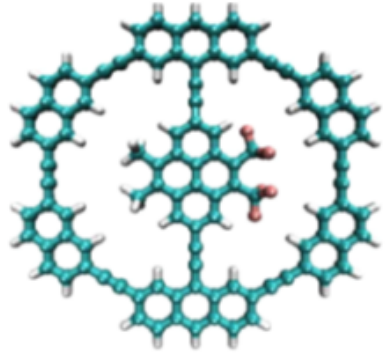
Publications

- Cheng-Wei Ni, Yu-Jie Wei, Yang-I Shen, and I-Ren Lee* "Long-Range Hairpin Slippage Reconfiguration Dynamics in Trinucleotide Repeat Sequences" J. Phys. Chem. Lett. 2019, 10, 3985-3990
- Tze-Yun Huang, Chung-ke Chang, Ya-Fen Kao, Chih-Hao Chin, Cheng-Wei Ni, Hao-Yi Hsu, Nien-Jen Hu, Li-Ching Hsieh, Shan-Ho Chou, I-Ren Lee*, and Ming-Hon Hou* "Parity-dependent hairpin configurations of repetitive DNA sequence promote slippage associated with DNA expansion" Proc Natl Acad Sci U S A. 2017, 114, 9535–9540

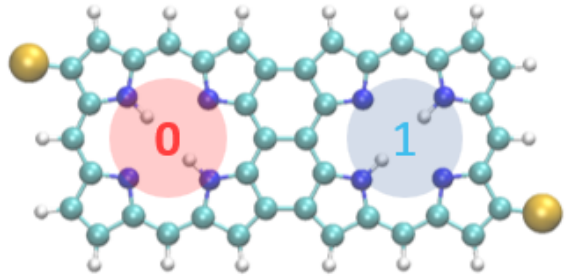
NTNU Department of Chemistry

Computational Design of Nano and Energy Materials

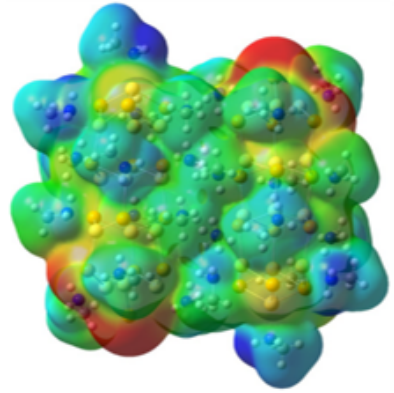
We focus on theoretical simulation, characterization and prediction of material systems with novel electronic properties. We applied computational chemistry to understand the catalytic chemical and electrochemical reaction mechanisms with an aim to help modify, optimize, and design new energy systems. We have carried out DFT investigations on fuel cells, CO2 recycling, and energy storage systems. We are also interested in applying first-principles studies to investigate the structural, electronic, and luminescence properties of small molecular systems in general. We have developed intimate collaborations with experimental groups in an aim to achieve a more profound understanding from a microscopic perspective.

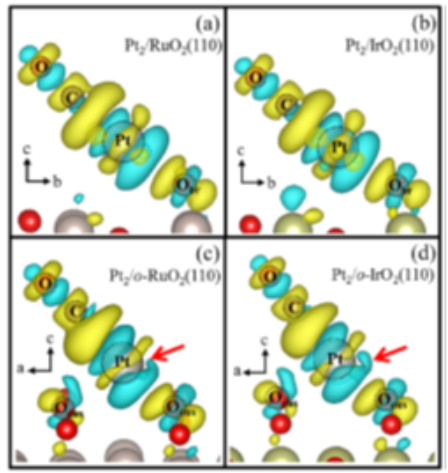


Single molecular electronics



Catalytic and Mechanistic Studies for Chemical Reactions





Elise Y. Li, Professor
Department of Chemistry
eliseytli@ntnu.edu.tw

Background:
PhD in Chemistry, Massachusetts Institute of Technology, Cambridge, MA, USA

Funding:
Ministry of Science and Technology
National Taiwan Normal University

Publications

- C.-Y. Liu and E. Y. Li*, "Termination Effects of Pt/v-$Ti_{n+1}C_nT_2$ MXene Surfaces for Oxygen Reduction Reaction Catalysis", ACS Appl. Mater. Interfaces, 2019, 11(1), 1638-1644
- E. Y. Li*, "Systematic and efficient band tracing for chiral CNTs via natural helical crystal lattice model", Carbon, 110, 336-342 (2016)
- T.-E. Hsieh†, T.-W. Yang†, C.-Y. Hsieh, S.-J. Huang, Y.-Q. Yeh, C.-H. Chen, E. Y. Li*, and Y.-H. Liu*, "Unraveling the Structure of Magic-Size $(CdSe)_{13}$ Cluster Pairs", Chem. Mater. 2018, 30(15), 5468-5477

Inorganic Chemistry

Minghuey Shieh, Distinguished Professor

Metal Cluster Chemistry,
Organometallics, Material Chemistry,
Computational Chemistry

Ming-Kang (Brad) Tsai , Distinguished Professor

Computational Chemistry, ChemInformatics,
Inorganic Chemistry & Physical Chemistry

Yi-Hsin Liu, Associate Professor

Inorganic materials for optical, electrical,
magnetic and thermoelectric applications
Mesoporous materials

Way-Zen Lee, Research Chair Professor

Bioinorganic Chemistry,
Biomimetic Catalysis,
Organometallics

I-Jy Chang, Professor

Photochemistry,
Bioinorganic Chemistry,
Chemical Education

Department of Chemistry

Chemistry of Metal Clusters and Beyond

My research covers syntheses, characterization, and reactivities of main-group element-containing transition metal carbonyl clusters or polymers and studies of their electrochemical and magnetic as well as photophysical properties with the aid of DFT calculations.

Techniques used in study

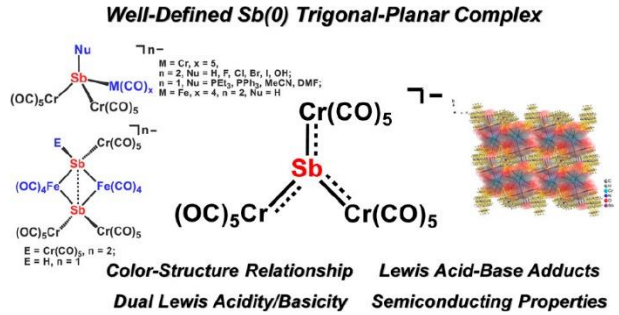
Single crystal X-ray analysis; NMR spectroscopy; Powder X-ray Diffraction; HR-MS; UV-vis spectroscopy; Electrochemistry; EPR spectroscopy; SQUID; X-ray photoelectron spectroscopy; X-ray absorption spectroscopy; DFT calculations.

Minghuey Shieh, Professor
Department of Chemistry, College of Science
mshieh@ntnu.edu.tw

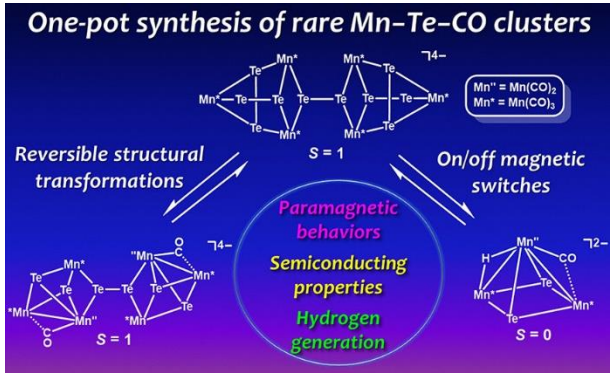
Background:
PhD in Chemistry, Rice University, Houston, Texas, United States

Funding:
Ministry of Science and Technology
National Taiwan Normal University

Low-Valent, Multiply Bonded, Trigonal-Planar Sb Complex



Manganese Telluride Carbonyl Complexes

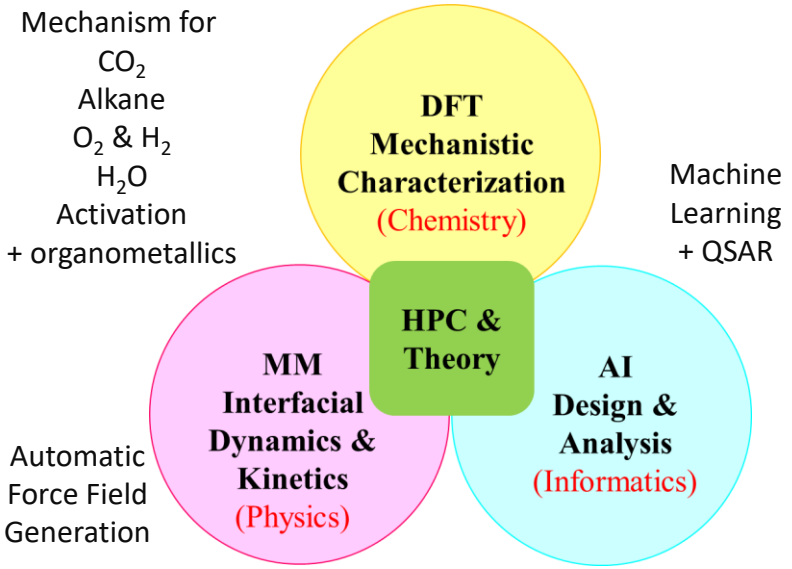


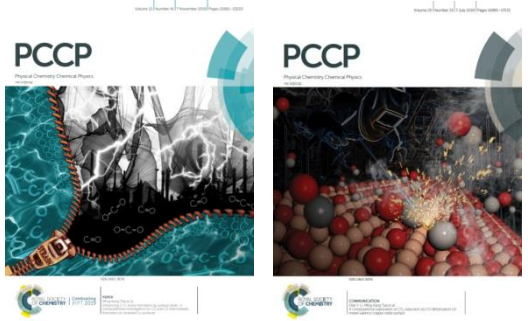
Publications

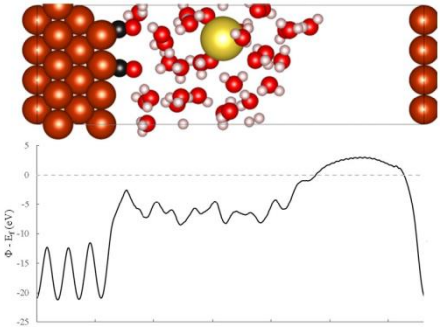
- M. Shieh,* Y.-H. Li, C.-H. Lin and T.-Y. Sun, "Low-Valent, Multiply Bonded, Trigonal-Planar Sb Complex: Rational Syntheses, Dual Acidic/Basic Properties, and Unexpected Semiconducting Characteristics," *Inorg*. *Chem*. **2020**, *59*, 16073.
- M. Shieh,* Y.-H. Liu, T.-S. Lin, Y.-C. Lin, W.-K. Cheng and R. Y. Lin, "Manganese Telluride Carbonyl Complexes: Facile Syntheses and Exotic Properties—Reversible Transformations, Hydrogen Generation, Paramagnetic, and Semiconducting Properties," *Inorg*. *Chem*. **2020**, *59*, 6923.

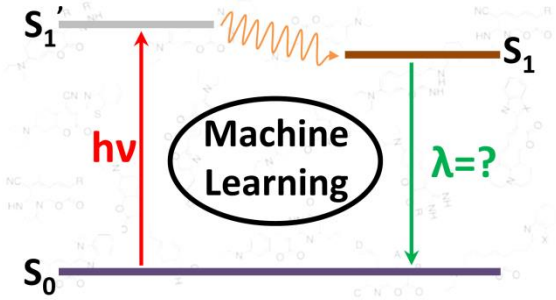
Department of Chemistry

Computational Molecular and Materials Design









Ming-Kang Tsai, Professor
Department of Chemistry
mktsai@ntnu.edu.tw

Background:
PhD in Computational Chemistry
University of Pittsburgh,
Pittsburgh, PA, USA

Funding:
Ministry of Science and Technology
NTU-System & ITRI Taiwan

Publications

- "Operando Time-resolved X-ray Absorption Spectroscopy to Unravel the Chemical Nature: Chemical State-Trapping Strategy Enabling the Highly Selective CO_2 Reduction", *Nat. Commun.* **2020**, 11, 3235
- "Predicting the Emission Wavelength of 10,000-plus Fluorescent Molecules by Clustering and Machine Learning Approaches", *RSC Adv*. **2020**, 10, 23834-23841
- "Enhancing C-C Bond Formation by the Surface Strain: Investigating the C2 and C3 Intermediate Formation on the Strained Cu Surfaces", *Phys. Chem. Chem. Phys.* **2019**, 21, 22704-22710. (cover highlight)
- "A Computational Exploration on CO_2 Reduction via CO Dimerization on Mixed-Valence Copper Oxide Surface", *Phys. Chem. Chem. Phys.* **2018**, 20, 16906-16909. (cover highlight)
- "Interplay between Polarizability and Hydrogen Bond Network of Water: Reparametrizing the Flexible Single-Point-Charge Water Model by the Nonlinear Adaptive Force Matching Approach", *J. Phys. Chem. A* **2018**, 122, 4654-4622.

Department of Chemistry

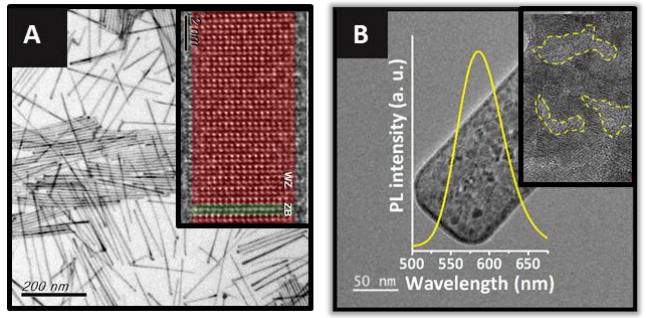
Mesoporous Semiconductors

Our researches mainly focus on the synthesis and characterizations of mesoporous and semiconductor materials with unique optical, electrical, magnetic and spintronic properties. Current research covers board topics of nano-material applications, including surface-enhanced Raman scattering (SERS), CO_2 reduction reactions (CO_2RR), diluted magnetic semiconductors (DMS) in fundamental aspects.

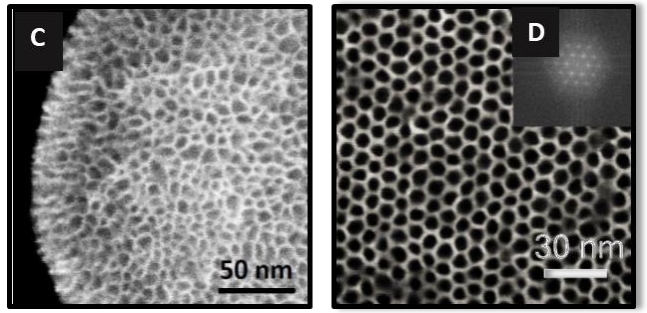
Techniques used in study

Powder X-ray diffraction (XRD), scattering (SAXS/GISAXS), absorption (EXAFS), EPR, MCD, time-resolved fluorescence microscopy, Raman, GC, TEM/HRTEM, SEM, AFM, BET *et al.*

Heterostructured 1D Nanowire and 2D Nanosheets



Mesoporous Nanoparticles and Thin-Film Materials



Yihsin Kyle Liu, Assistant Professor
Department of Chemistry
yliu@ntnu.edu.tw

Background:

PhD in Chemistry, Washington University, St. Louis, MO, USA

Funding:

Ministry of Science and Technology
Ministry of Education

Publications

- Kao, K.-C.; Lin, C.-H.; Chen, T.-Y.; **Liu, Y.-H.**; Mou, C.-Y., A General Method for Growing Large Area Mesoporous Silica Thin Films on Flat Substrates with Perpendicular Nanochannels. *J. Am. Chem. Soc.* **2015,** *137*, 3779-3782
- Hsieh, T.-E.; Yang, T.-W.; Hsieh, C.-Y.; Huang, S.-J.; Yeh, Y.-Q.; Chen, C.-H.; Li, E. Y.; **Liu, Y.-H.**, Unraveling the Structure of Magic-Size $(CdSe)_{13}$ Cluster Pairs. *Chem. Mater.* **2018,** *30*, 5468-5477.
- Chang, H.-J.; Chen, T.-Y.; Zhao, Z.-P.; Dai, Z.-J.; Chen, Y.-L.; Mou, C.-Y.; **Liu, Y.-H.**, Ordered Mesoporous Zeolite Thin Films with Perpendicular Reticular Nanochannels of Wafer Size Area. *Chem. Mater.* **2018,** *30*, 8303-8313.

Organic Chemistry

Kwunmin Chen, Distinguished Professor & VP

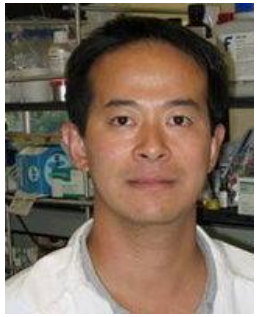
Organic Asymmetric Catalytic Synthesis

Ching-Fa Yao, Distinguished Professor

Physical Organic Chemistry,
Organic Synthesis

Wenwei Lin , Outstanding Professor

Synthetic Methodology,
Asymmetric Organic Catalysis

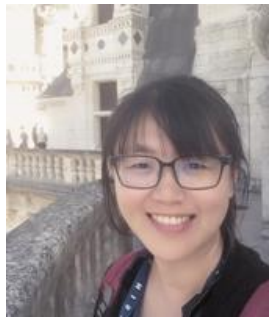


Tun-Cheng Chien, Professor

Organic, Bioorganic and Medicinal Chemistry

Hsyueh-Liang Wu, Outstanding Professor

Organic Chemistry Asymmetric Synthesis
Natural Product Synthesis



Ling-Hsien Tu, Professor

Biochemistry,
Protein error reentry and disease research

Department of Chemistry

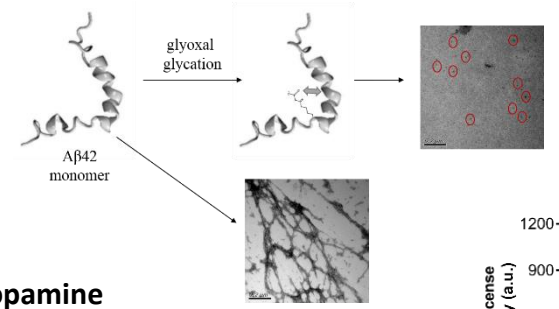
Study the amyloid formation and find solutions for amyloidosis

Our research interests mainly focus on amyloid formation which is an unusual process that hundreds to thousands of monomeric peptides or proteins polymerize into long starch-like but unbranched fibrils. Besides understanding the mechanism of amyloid formation, we also developed therapeutic strategies such as use of natural compounds and nanomaterials to prevent amyloid formation. One the other hand, we were looking for fluorescent molecules which can be utilized to label amyloid.

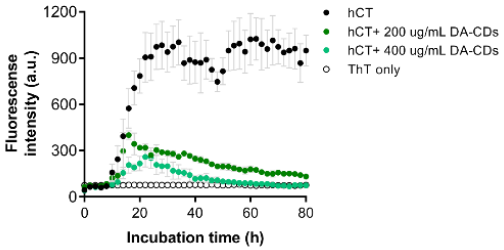
Techniques used in study

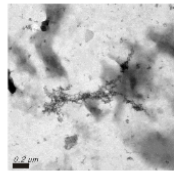
Peptide preparation: Peptide synthesizer, HPLC, MALDI
Biophysical Characterization: Fluorimeter, DLS, CD, FTIR, TEM
Other related analysis: gel electrophoresis, protein binding assay.

Exploring the impact of glyoxal glycation on β-amyloid peptide (Aβ) aggregation in Alzheimer's disease



Dopamine conjugated carbon dots inhibit human calcitonin fibrillation





Ling-Hsien Tu, Associate Professor
Department of Chemistry
litu@gapps.ntnu.edu.tw

Background:
PhD in Chemistry, Stony Brook University, NY, USA

Funding:
Ministry of Science and Technology
National Taiwan Normal University

Publications

- TDP-43 interacts with amyloid-β, inhibits fibrillization, and worsens pathology in a model of Alzheimer's disease, **2020**, Nature Communications, 11
- Role of Lysine Residue of Islet Amyloid Polypeptide in Fibril Formation, Membrane Binding, and Inhibitor Binding, **2020**, Biochimie, 177
- A Fluorogenic Molecule for Probing Islet Amyloid Using Flavonoid as a Scaffold Design, **2020**, Biochemistry, 59
- Inhibiting Human Calcitonin Fibril Formation with Its Most Relevant Aggregation-Resistant Analog, **2019**, J. Phys. Chem. B, 123
- Protein Glycation by Glyoxal Promotes Amyloid Formation by Islet Amyloid Polypeptide, **2019**, Biophysical Journal, 116

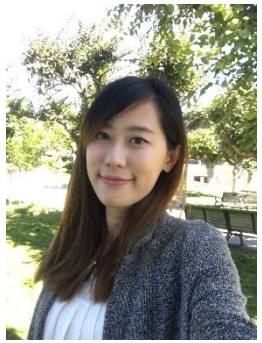
Analytical and Applied Chemistry

Chia-Jung Lu, Outstanding Professor

Micro Gas Chromatography,
MEMS Analytical Devices
Nano Material for Gas Sensor

Cheng-Huang Lin , Professor (Joint)

Mass Spectrometry
Raman Spectrometry
Art restoration and appraisal



Chun-Ting Li, Associate Professor

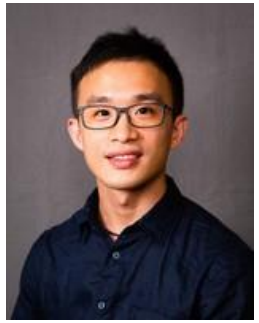
Nanomaterials,
Electrochemical catalysis and analysis,
Dye-sensitized/perovskite solar cells

Sung-Fang Chen, Professor

Biochemical Mass Spectrometry
Food & Drug Analysis
Proteomics

Yi-Chun Yeh, Professor (Organic)

Biochemistry、Synthetic Biology、
Bioenergy、Biosensor



Chong-You Chen, Assistant professor
Analytical Chemistry, Nanomaterials,
Analytical Sensors

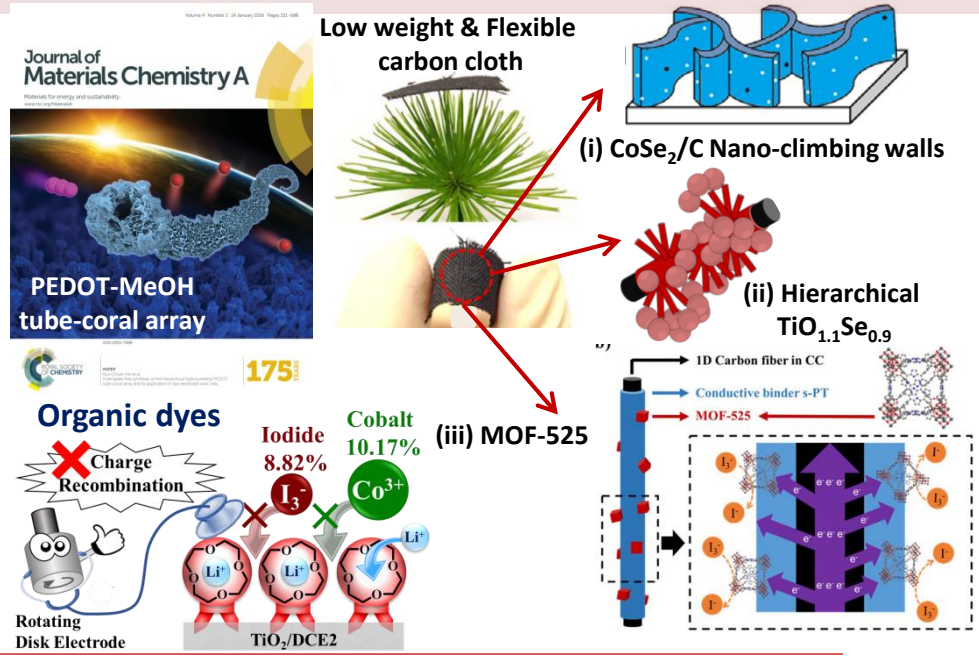
Department of Chemistry

Functional Materials for High Performance Dye Sensitized/Perovskite Solar Cells

My research interests principally focus on synthesizing and developing electro-catalysts, sensitizers, and redox mediators for electrochemical devices, including dye-sensitized solar cells as well as energy conversion & storage materials/systems with particular attention to electrochemical analytical techniques.

Techniques used in study

- Design and synthesis of functional nanomaterials, catalysts, metal-complex redox shuttles, and metal-free organic dyes
- X-ray diffraction pattern, X-ray photoelectron spectroscopy, Field-emission scanning electron microscope, Transmission electron microscope, Electrochemical, Impedance, and Interfacial charge transfer analyses
- Dye-sensitized solar cell fabrication and optimization



Chun–Ting Li, Assistant Professor
Department of Chemistry, College of Science
ctli@gapps.ntnu.edu.tw

Background:
PhD in Chemical Engineering, National Taiwan University, Taipei, Taiwan

Funding:
Ministry of Science and Technology
National Taiwan Normal University

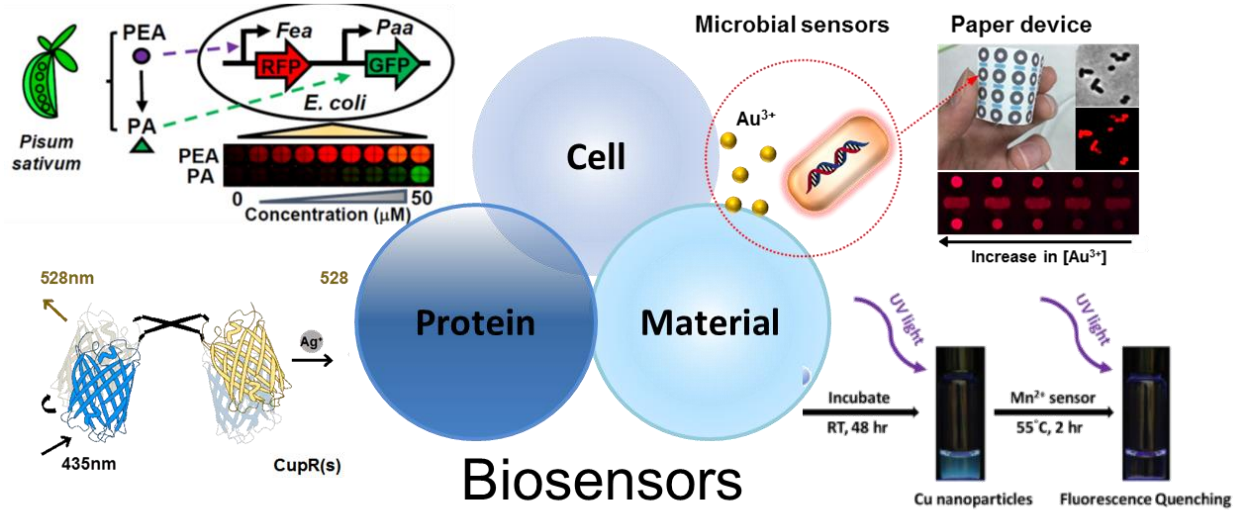
Publications

- **Chun-Ting Li** et al., "Tetraphenylethylene tethered phenothiazine-based double-anchored sensitizers for high performance dye-sensitized solar cells," *J. Mater. Chem. A*, 7 (2019) 23225-23233.
- **Chun-Ting Li** et al., "Effective suppression of interfacial charge recombination by a 12-crown-4 substituent on a double-anchored organic sensitizer and rotating disk electrochemical evidence," *J. Mater. Chem. A*, 5 (2017) 7586-7594.
- Chuan-Pei Lee[+], **Chun-Ting Li**[+], Kuo-Chuan Ho*, "Use of organic materials in dye-sensitized solar cells," *Mater. Today*, 20 (2017) 267-283.
- **Chun-Ting Li** et al., "Hierarchical $TiO_{1.1}Se_{0.9}$-wrapped carbon cloth as the TCO-free and Pt-free counter electrode for iodide-based and cobalt-based dye-sensitized solar cells," *J. Mater. Chem. A*, 5 (2017) 14079-14091.

Department of Chemistry

Study the whole-cell based biosensors

Our researches mainly focus on the use of engineered microorganisms in the detection of heavy metals and small molecules including L-DOPA, dopamine, tyrosine, phenylalanine, etc. Using synthetic biology technique, we developed dual signal sensors for simultaneous quantification of multiple analyates in one single platform.



Techniques used in study

Molecular biology
Protein purification
Western blot analysis
Immunofluorescent staining
HPLC analysis; HRMS; Spectroscopy
Material science; characterization

Yi-Chun Yeh, Professor
Department of Chemistry
yichuny@ntnu.edu.tw

Background:
PhD in Department of Chemistry, Stanford University, CA

Funding: Ministry of Science and Technology; National Taiwan Normal University

Publications (corresponding author)

- Lin YK and Yeh YC* (2017). Dual-Signal Microbial Biosensor for the Detection of Dopamine without Inference from Other Catecholamine Neurotransmitters. Analytical Chemistry, 89(21):11178-82.
- Kuo KH, Lu KH, and Yeh YC* (2018). Cell-Based Biosensor with Dual Signal Outputs for Simultaneous Quantification of Phenylacetic Acid and Phenylethylamine. ACS synthetic biology, 7, 12, 2790-95.
- Kuo KH, Chen PH, Lin C, Chen CF, Lee IR, and Yeh YC* (2018). Determination of Gold Ions in Human Urine Using Genetically Engineered Microorganisms on a Paper Device. ACS Sensors, 3, 4, 744-48.
- Chou YC, Shih CI, Chiang CC, Hsu CH, and Yeh YC* (2019). Reagent-free DOPA-dioxygenase Colorimetric Biosensor for Selective Detection of L-DOPA. Sensors and Actuators B: Chemical, 297, 12617-20.

Visiting Professors

Takumi Konno, Professor

Coordination Molecular Technology
Nanotechnology

Tamio Hayashi, Professor

Asymmetric Catalysis
Organometallic chemistry

PRECISION INSTRUMENTS CENTER

Nuclear Magnetic Resonance Spectrometer

X-ray Spectrometer: Single Crystal & Powder

Electron-Spin Spectrometer (EPR)

High Resolution Mass Spectrometers:

MALDI-TOF, Triple-TOF, Double-Focusing

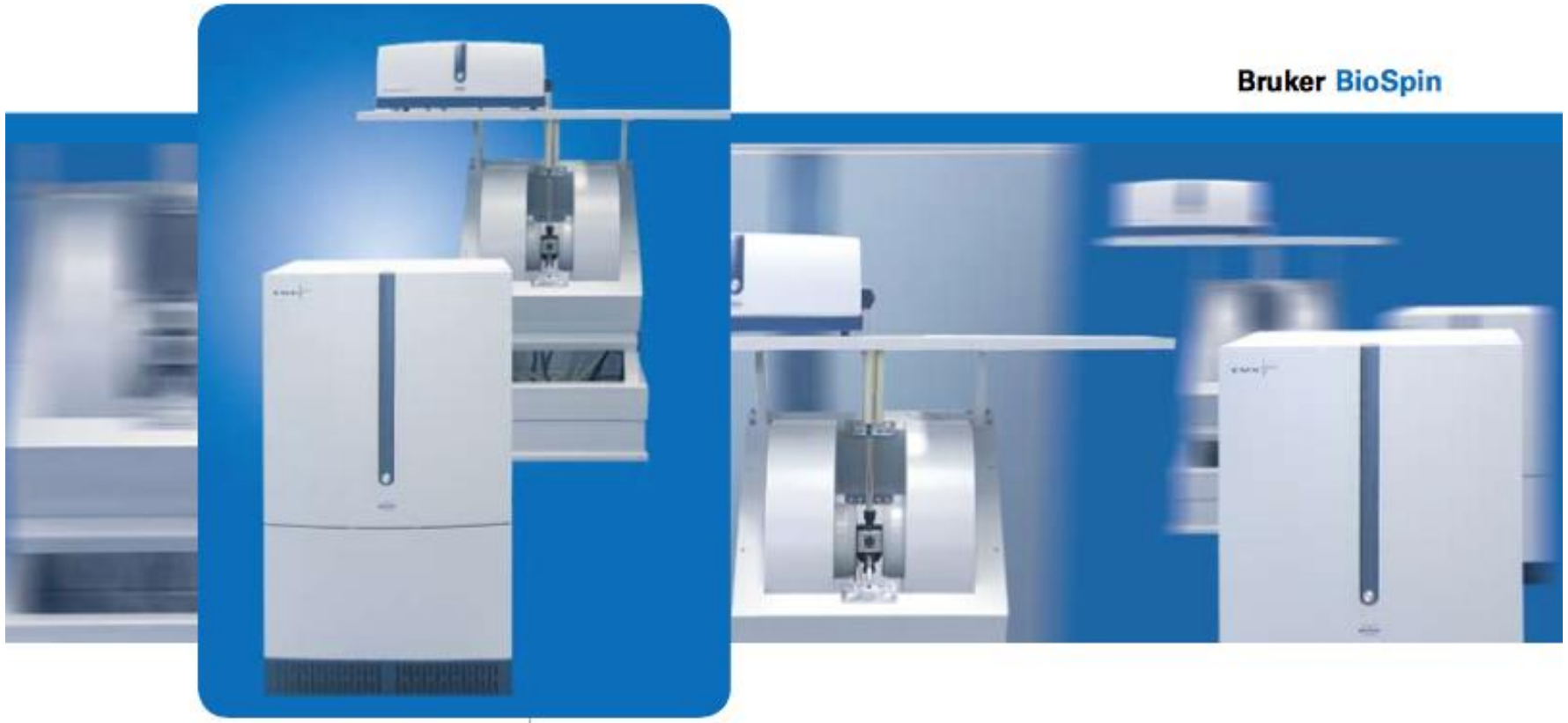
……..

Superconducting Nuclear Magnetic Resonance Spectrometer

X-RAY Single Crystal/Powder Diffractometer

EMX^{plus}– 10/12/P/L Electron-Spin Resonance Spectrometer System

E7001039 of the EMX^{plus} Series



High Resolution Mass Spectrometer

Matrix-Assisted Laser Desorption/Ionization Time-of-flight (MALDI-TOF) Mass Spectrometer

Outreach Chemical Education

Junior Chemical Experiment Courses

High School Girl's Scientific Tours

Marie Currie Summer Camp

Aborigines Students Scientific Education

International Chemistry Olympiad

Total number of medals won by Taiwanese IChO team since 1992

Gold	Silver	Bronze
64	52	11

PROF. I-JY CHANG ELECTED AS INTERNATIONAL STEERING COMMITTEE (CHAIR FOR 2016-2017)

Upcoming IChO's

2023, 55th IChO in Zurich, Switzerland

56TH IChO International Chemistry Olympiad Saudi Arabia 2024

Future Olympiads

IChO 2025
United Arab Emirates

IChO 2026
Uzbekistan

2027
Welcome to Taiwan!!

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International Ties/Collaborations

- Kyushu University – Strategic Partner since 2015
- Joint symposiums between scholars of the chemistry dept from both sides
- Double-Degree Master Program with Kyushu University

International Ties/Collaborations

- UC Berkeley – NTNU Elite Researcher Bilateral Symposiums since 2016
- Undergraduate student exchange program (3 students for 6 weeks) at UC Berkely

Double Degree Programs

DD Master Program with Kyushu University since 2022

- 5 students per year from College of Science and College of Technology and Engineering
- 30 Course credits from Kyushu U, practically can be finished within one semester and one summer school
- One research thesis in English for at least 40 pages co-supervised by both sides

Double Degree Programs

DD PhD Program with Osaka University since 2023

Agreement on a Double Degree Program (Ph.D.) between GSS-OU and College of Science-NTNU

COTUTELLE AGREEMENT

BETWEEN

the Graduate School of Science, Osaka University, Japan

AND

the College of Science, National Taiwan Normal University, Taiwan

Department of Chemistry

Thank You !