I²CNER Seminar Series

International Institute for Carbon-Neutral Energy Research (WPI-I²CNER)
Kyushu University

Title **Advancements in Organic Functional Electronics: Innovations in Imaging and Energy Harvesting Devices**

Speaker Prof. Shun-Wei Liu
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Center for Sustainability and Energy Technologies, Chang Gung University, Taoyuan 33302, Taiwan

Time& Date 10:00 AM(JST), Tuesday, June 25th, 2024

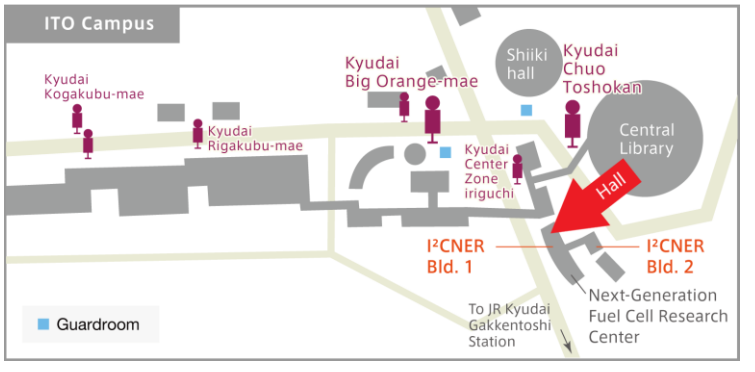
Venue Hybrid (#217, Conference Room, I²CNER Bldg. 1, Ito Campus / Webinar)

Abstract

In recent research, we've highlighted the potential of organic up-conversion imagers, combining organic infrared photodetectors and organic light-emitting diodes (OLEDs), as promising tools for visualizing infrared images. This concept gained attention from NATURE's research highlight, being noted as an anti-surveillance device capable of detecting invisible signals [Nature, *617* (2023) 227]. Our previous work showcased a device with a turn-on voltage below 1.7 V, producing high-quality images exceeding 1500 ppi resolution, as detailed in Nano Energy [Nano Energy, *86* (2021) 106043]. Additionally, the device maintained over 65% visible transparency, detected infrared intensity below 1 μW/cm^2, and offered a linear dynamic range exceeding 80 dB, as outlined in Science Advances [Sci. Adv., *9* (2023) eadd7526]. Expanding on this, we introduced a novel device configuration with a charge generation layer linking two OLED display units, achieving an upconversion efficiency of over 30%, as reported in Advanced Science [Adv. Sci., *10* (2023) 2302631]. Furthermore, Advanced Functional Materials [Adv. Funct. Mater., *34* (2024) 2309589] recently accepted an all-solution process for developing organic imagers, featuring Zn-doped $CsPbBr_3$ quantum dots.
Concerning energy harvesting, we proposed transparent organic solar cells with transmittance exceeding 75% to capture UV/NIR light from ambient conditions. Such cells could replace a watch's cover glass to harness free power from ambient light. Additionally, vacuum-deposited perovskite solar cells show promise in capturing weak indoor light. I intend to delve deeper into our research experiences, perspectives, and device design strategies during my presentation. If possible, I also look forward to engaging in constructive dialogue with our audience, enriching our collective understanding of the fundamental concepts and design principles behind organic imagers and energy harvesting applications.

About the Speaker

Dr. Shun-Wei Liu currently holds the esteemed position of Distinguished Professor in the Department of Electronic Engineering at Ming Chi University of Technology (MCUT). Furthermore, he serves as the Director of MCUT's Organic Electronics Research Center, demonstrating his leadership and expertise in the field. Dr. Liu's scholarly pursuits primarily focus on unraveling the fundamental physics underlying organic and perovskite materials, while investigating their potential applications in cutting-edge optoelectronic devices. His research encompasses a wide range of devices, including SWIR/NIR organic imagers, transparent photovoltaics, medical OLED lighting, perovskite PD/PV, and ultra-lightweight electronics. With an extensive publication record, Dr. S. -W. Liu has authored over 150 articles in esteemed international journals, achieving a commendable H-index of 36 according to the Google Scholar database. Over the past five years, his research group has successfully licensed their innovative display and sensing concepts to various companies, resulting in a cumulative royalty sum of $600,000 USD. These significant achievements earned Dr. Liu several prestigious accolades in Taiwan, including the renowned "Ta-Yao Wu Memorial Award," the distinguished "Award for Excellent Contribution in Technology Transfer," and the notable "Outstanding Young Researcher Award" in 2018. Additionally, in 2023, his upconversion electronics were selected for the "Future Technology Award" at the Taiwan Innotech Expo.



Registration https://forms.office.com/r/a4xVesgK1v

Host Prof. Motonori Watanabe

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