The Electrochemical Society
ECS@UC San Diego Student Chapter

Sustainable Power and Energy Center

Design and synthesis of semiconducting polymers for nature-inspired electronics and energy

August 6th 2025, 9:30 AM PST, CMRR Auditorium

Prof. Ho-Hsiu Chou, Ph.D.
National Tsing Hua University
Professor, Department of Chemical Engineering

Bio: Prof. Ho-Hsiu Chou received his Ph.D. in Chemistry from National Tsing Hua University (NTHU), Taiwan, in 2010. He subsequently conducted postdoctoral research at NTHU, IMEC in Belgium, and Stanford University in the Department of Chemical Engineering. He is currently a Full Professor in the Department of Chemical Engineering at NTHU and is jointly appointed with the College of Semiconductor Research. His research focuses on molecular design and interfacial science of functional polymers for sustainable energy, flexible electronics, and recyclable materials. Prof. Chou has received numerous awards in recognition of his contributions to polymer science and energy research. These include the Ta-You Wu Memorial Award, the Rising Stars in Polymer Science Award, the Outstanding Young Scholar Awards from the Catalysis Society of Taiwan, the Carbon Society of Taiwan, and the Taiwan Association for Hydrogen Energy and Fuel Cell, as well as the SCEJ Award for Outstanding Asian Researcher and Engineer from Japan. He is also the recipient of the NSTC Young Scholar Fellowship, the LCY Outstanding Young Professor Research Award, and the Tsing Hua Distinguished Professor Award. In addition to research, Prof. Chou plays a key role in academic leadership. He currently serves as the Director of the Administrative Affairs Division at NTHU's Operations Center for Industry Collaboration and Deputy Director of the Photonics Research Center. Since 2022, he has also served as President of the OLED/PLED Society of Taiwan, fostering interdisciplinary collaboration and industrial partnerships.

Abstract: Our research is fundamentally driven by molecular design and interfacial science, aiming to control polymer structures and their interactions to achieve targeted functions. This talk highlights how we apply these core principles to develop advanced polymeric materials for nature-inspired applications, focusing on two representative directions: electronic skin and artificial photosynthesis. Skin, as the largest organ in the human body, performs multiple functions such as pressure and temperature sensing, stretchability, and self-healing. Mimicking these properties, electronic skin (e-skin) has emerged as a promising field that integrates material flexibility with sensory capabilities. In this context, we design organic and polymeric materials with tailored architectures to achieve stretchable, self-healing, and conformable sensors that emulate skin-like behaviors. Our approach emphasizes the importance of controlling molecular mobility, dynamic bonding, and interfacial compatibility. In parallel, we draw inspiration from natural photosynthesis to develop polymer-based photocatalysts for solar-driven hydrogen production via water splitting. By fine-tuning polymer backbones, energy levels, and nanostructures, we create polymer dots (Pdots) and bulk materials capable of efficiently harvesting visible light. This part of the talk will discuss our strategies in conjugated polymer design, the role of hydrophilic/hydrophobic interfaces, and mechanistic insights into charge separation and reaction kinetics.Through these two platforms—e-skin and artificial photosynthesis—we demonstrate how molecular design and interfacial control can converge to enable innovative functions, offering pathways to address grand challenges in sustainable energy and wearable electronics.

Keywords: Semiconducting Polymer, Self-healing, Electronic Skin, Water-splitting, Solar-driven Hydrogen Evolution

Join ECS@UC San Diego Student Chapter! Website: https://www.smelab.org/ecs-chapter
LinkedIn: www.linkedin.com/company/ecs-uc-san-diego-student-chapter