

# UNIVERSITY OF CALIFORNIA, IRVINE

## DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING

### SPECIAL SEMINAR

***“ORGANIC SEMICONDUCTOR-INCORPORATED  
PEROVSKITES (OSIP) – A NEW FAMILY OF HYBRID”***



**LETIAN DOU**

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**Friday, May 3, 2024**

**11:00 AM - 12:30 PM**

**Engineering Tower, Conference Room 652**

**Abstract:** Halide perovskites are exciting new semiconductors that show great promising in low cost and high-performance optoelectronics devices including solar cells, LEDs, photodetectors, lasers, etc. However, the poor stability is limiting their practical use. In this talk, I will present the development of a new family of stable organic-inorganic hybrid electronic materials, namely, Organic Semiconductor-Incorporated Perovskites (OSiP). Energy transfer and charge transfer between adjacent organic and inorganic layers are extremely fast and efficient, owing to the atomically-flat interface and ultra-small interlayer distance. Moreover, the rigid conjugated ligands dramatically enhance materials' chemical stability and suppresses solid-state ion diffusion and electron-photon coupling, making them promising for many applications. Based on this, we demonstrate for the first time an epitaxial halide perovskite heterostructure with near atomically-sharp interface, which pave the way for perovskite nanoelectronics and nanophotonics. Finally, using this stable and solution-processable OSiPs, we demonstrate the fabrication of high-quality thin films, which enable highly stable and efficient solar cells and LEDs.

**Bio:** Dr. Letian Dou is currently the Charles Davidson Associate Professor of Chemical Engineering and Chemistry (by courtesy) at Purdue University. He obtained his B.S. in Chemistry from Peking University in 2009 and Ph.D in Materials Science and Engineering from UCLA in 2014. From 2014 to 2017, he was a postdoctoral fellow at University of California-Berkeley and Lawrence Berkeley National Laboratory. His research interest includes design and synthesis of organic-inorganic hybrid materials, low-dimensional materials, and sustainable polymers, fundamental understanding of the structure-property relationships of soft materials, as well as their applications in energy-efficient devices. He is a recipient of Humboldt Research Fellowship (2024), Purdue College of Engineering Faculty Excellence Award for Early Career Research (2023), Waterloo Institute for Nanotechnology (WIN) Rising Star Award (2022), AIChE Owens Corning Early Career Award (2022), NSF CAREER Award (2021), Advanced Materials Rising Stars Award (2021), Office of Naval Research Young Investigator Award (2019), Highly Cited Researcher in Cross-Fields (2019-present), MIT Technology Review Innovators Under 35-China Award (2018), and MRS Graduate Student Award (2014), among others.