

JEFFREY I. ZINK INORGANIC CHEMISTRY SEMINAR SERIES



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“When Pore and Fulle met Semi: A Tale of Material Architectonics”

Abstract: With the advancement of technology, there is an increasing demand for multifunctional materials that combine optical, electronic, mechanical, and ionic properties. Hybrid metal halide semiconductors (MHS) exhibit a unique set of finely tunable properties, providing a versatile platform to address limitations in current technologies. In particular, introducing controlled porosity could enable their use in previously unexplored applications such as sensing, electrocatalysis, and solid-state batteries, while the assembly of crystalline MHS that integrate the characteristics of both organic and inorganic semiconductors can open new directions in materials engineering.

Motivated by these synthetic challenges, we recently developed a general strategy for generating porosity in MHS using molecular cages serving as structure-directing agents and counter-cations. The corresponding material is stable in water for over three years, an unparalleled performance for hybrid metal halide and perovskite materials, while the generation of porosity opens up new pathways toward unexplored applications (e.g., solid-state batteries and the hydrogen evolution reaction (HER)).

Taking a step further in material design, we designed and synthesized an unprecedented crystalline fullerene-based 2D metal halide semiconductor, namely $(C_{60}-2NH_3)Pb_2I_6$, ($C_{60}-2NH_3$ = bis(2-aminoethyl) malonate- C_{60}), as a benchmark material to shed light on the interactions among semiconducting heterostructures. To the best of our knowledge, this is the first report of a fullerene-based metal halide semiconductor in single-crystal form, and it was regarded by many as an improbable material to synthesize. We consider this compound to set the foundation of a new family of materials, namely, crystalline fullerene-based metal halide semiconductors (FMHS), with applications beyond photovoltaics to capacitors, catalysis and sensors.

Meet the Speaker

11:45 a.m. | YH 3096

Wednesday, October 28th, 2026

4:00 p.m. | YH4222 - Collaboratory

Dongwon Yoo Seminar & Conference Hall

UCLA College | Physical Sciences
Chemistry & Biochemistry

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