

UCSD NANOENGINEERING/CHEMICAL ENGINEERING
SPECIAL SEMINAR

Wednesday, August 28, 2019

Seminar Presentation: 11:00am – 12:00pm

CMRR Auditorium*“Material Characterizations and Designs
for Energy Storage and Thermal Management”***Yuan Yang Ph.D.***Assistant Professor**Department of Applied Physics and Applied Mathematics
Columbia University*

Abstract: High-performance energy storage, conversion and management are critical to a sustainable future. Among various energy technologies, electrochemical energy storage and thermal energy management are of special importance. Electrochemical energy storage, such as batteries, is a promising solution to vehicle electrification and the utilization of renewable energy. On the other side, thermal energy counts for over 80% of primary energy generation and usage. In both areas, fundamental characterizations and designs of materials are critical to understanding underlying mechanisms and creating new materials with high performance. In this talk I will present three examples in characterizing and designing materials. The first one is to use an emerging stimulated Raman scattering microscopy to visualize ion transport in electrolyte and electrode-electrolyte interactions. Such studies unveil the strong correlations between ion concentration and lithium dendrite growth. They also unveil effectiveness of different methods to passivate lithium dendrite growth in lithium batteries. The second example is to design solid electrolyte to enhance both safety and energy density of batteries. The third example is to design hierarchical porous materials to realize electricity-free cooling for efficient building energy management. Such porous material can reflect >96% of sunlight and emit heat effectively to the cold sky, and results in sub-ambient cooling.

References:

1. Cheng, Q et al., Operando and Three-Dimensional Visualization of Anion Depletion and Lithium Growth by Stimulated Raman Scattering Microscopy, *Nature Communications*, 9, 2942 (2018)
2. Cheng, Q et al., Boron Nitride-Based Nanocomposite Coating for Stabilizing Solid Electrolyte/Anode Interface in Lithium Metal Batteries. *Joule*, 3, 1510.
3. Mandal, J et al., Hierarchically porous polymer coatings for highly efficient passive daytime radiative cooling. *Science*, 362, 315-319 (2018).

Biosketch: Dr. Yuan Yang is currently an assistant professor of materials science in department of applied physics and applied mathematics at Columbia University. He received his B.S. in physics at Peking University in 2007, followed by the completion of his Ph.D. in materials science and engineering at Stanford University in 2012. After graduation, he spent three years in the department of mechanical engineering at MIT, until 2015. Dr. Yang’s research interests include advanced energy storage and thermal energy management. He is a Scialog fellow on Advanced Energy Storage, and won Young Innovator Award by *Nano Research* in 2019.