



# M I C R O - N A N O S E M I N A R

Wednesday, March 4, 2020 3:00 pm – Room 3-133



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## Materials Innovations for Emerging Energy Technologies

### Abstract

In this seminar, I will briefly discuss my group's motivations, research overview, and selective achievements in the following two topics:

- High energy density, low-cost, and safe **solid-state batteries** made with ceramic electrolytes, covering topics from fundamentals (e.g., interface, critical current density, Li dendrite formation, *Nature Materials* 2017, 16, 572), diagnostics (e.g., neutron depth profiling, *JACS* 2017, 139, 14257), and the design/fabrication of high energy density batteries using 3D structures (*PNAS* 2018, 157, 3770);
- **Extreme high temperature** (2000–3000 K) as a disruptive platform to design/synthesize novel materials, from single atom, high entropy nanoparticles (*Science* 2018, 359, 1489, Cover) to bulk ceramics/metals for energy technologies and other applications in extreme conditions (*Science* 2020).

I will then devote most of the time to **wood nanocellulose as a material platform** for designing new structures to manipulate ion, phonon, photon, and mechanical properties, with end applications in lightweight, energy-efficient transportation (super wood, *Nature* 2018, 554, 224), energy-efficient green buildings (cooling wood, *Science* 2019, 364, 760), and high-performance membranes for the water-energy nexus (ionic wood, *Nature Materials* 2019, 18, 608).

### Biography

Liangbing Hu received his B.S. in physics from the University of Science and Technology of China in 2002, where he worked on colossal magnetoresistance (CMR) materials for three years. He did his Ph.D. (2002–2007) at UCLA, focusing on carbon-nanotube-based nanoelectronics. In 2006, he joined Unidym, Inc. as a co-founding scientist, leading the development of roll-to-roll printed carbon nanotube films and device integration in touch screens, LCDs, flexible OLEDs, and solar cells. He did his postdoc at Stanford University from 2009–2011, where he worked on various energy storage technologies using nanomaterials/nanostructures. Currently, he is a Minta Martin professor at the University of Maryland, College Park. His research group focuses on materials innovations, device integrations, and manufacturing in general, with ongoing research activities on wood nanotechnologies, 3000 K extreme materials, and beyond Li-ion batteries.

Hu has published over 350 research papers (including *Science* and *Nature*) and given more than 150 invited talks. He has received many awards, including: Highly Cited Researchers list by Clarivate Analytics (2016, 2017, 2018, 2019), Young Innovator Award (2019, Wiley-Small Journal); Blavatnik Awards for Young Scientists (2019 Finalist); TAPPI Nano Middle Career Award (2019); 2019 Exemplary Research Recognition, 2018 R&D 100 Winner, 2018 HIVE 50 Innovator, the Nano Letters Young Investigator Lectureship (2017), Office of Naval Research Young Investigator Award (2016), ACS Division of Energy and Fuel Emerging Investigator Award (2016), SME Outstanding Young Manufacturing Engineer Award (2016), University of Maryland Invention of the Year (2019, 2014), Air Force Young Investigator Award (AFOSR YIP, 2013).

Please email Prof. Xuanhe Zhao at [zhaox@mit.edu](mailto:zhaox@mit.edu) if you have any questions regarding this seminar.