Materials Science and Engineering Department

Fall Seminar Series

Breaking the Symmetry: New Methods to Create Nanoparticles and Interfaces

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Materials Science and Engineering
Iowa State University

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3-4PM

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Most of the conventional particles are homogeneous and spherical. We have developed new synthetic platforms to fabricate anisotropic non-spherical Janus particles, ranging from 20 nm to 10 μm, which have shown interesting properties that have not been discovered before. These particles can be made from both inorganic and organic components with various surface chemistry. On the one hand, they behave like small surfactant molecules, adsorbing strongly at interface and assembling into clusters. On the other hand, the assembled structures demonstrate new properties and functionalities. For example, with Au-Fe_3O4 nanocrystals, we have shown that the assemblies are responsive to external magnetic field. Triggered release is achieved using an infrared laser by taking advantage of the enhanced surface plasmon resonance. Furthermore, through a unique process of self-stratification with polymeric Janus particles, we have developed a novel approach to create layered surface structures that can lead to coating materials of superior performance. These new technologies offer platforms to build next generation of smart materials that can be broadly applied in areas including surface protection, sensing, biomedical application, and additive manufacturing.

Shan Jiang is Associate Professor in the Department of Materials Science and Engineering at the Iowa State University of Science and Technology. Dr. Shan Jiang is an Assistant Professor in the Materials Science and Engineering department at Iowa State University. He obtained his Ph.D. from the University of Illinois at Urbana-Champaign, working with Professor Steve Granick on Janus particles. After graduation, he furthered his study at MIT Langer lab as a postdoc on gene delivery. He then worked at the Dow Chemical Company Coating Materials as a project leader and helped develop different products. Dr. Jiang has published more than 50 peer reviewed journal articles, book chapters and 3 U.S. patents. His work at Iowa State has been featured on several journal covers. Dr. Jiang was awarded with the Racheff-Intel Award for Outstanding Graduate Research. The technology he participated in developing at Dow received the Presidential Green Chemistry Challenge Award and the R&D 100 Award. He has received the ACS Younger Chemists Committee Leadership Development Award, Early Achievement in Teaching Award, Miller Faculty Fellowship, the Education Leadership Award, Dean's Excellence in Learning and Teaching Grant and the 3M non-tenured faculty award.

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