

# MSE SPECIAL SEMINAR

MATERIALS SCIENCE & ENGINEERING | SPRING 2018

WEDNESDAY, APRIL 11, 2018 | 243 WILCOX HALL | 10:30 AM



## Towards Scalable Processing of Nanostructured Materials via Liquid Metal Dealloying

Decades of research have been devoted to developing nanostructured materials for applications ranging from heterogeneous catalysts to high-strength structures. However, fabrication techniques for these materials are frequently resource-intensive, and cannot be translated into commercial-scale processing. I will describe a scalable route to creating nanostructured materials and controlling their microstructure using liquid metal dealloying (LMD): a self-organization process that relies on selective dissolution to drive the emergence of a complex architecture with a controllable morphology and feature size. Unlike conventional aqueous dealloying, LMD may be used to synthesize bulk quantities of fully-dense nanocomposite materials. I will identify the key kinetic parameters controlling pattern formation in LMD and discuss how they may be tuned to fabricate materials with a variety of morphologies – globular, lamellar, and bicontinuous – and a large breadth of microstructural length scales – 30 nm to 10  $\mu\text{m}$ . I will then give an overview of the promising thermo-mechanical properties of these new materials, including high thermal stability, high strength, and the potential to work harden. These results highlight opportunities for designing and synthesizing bulk nanocomposite metals with superior properties by tuning their microstructure morphology.



### Ian McCue

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Ian McCue is a postdoctoral researcher at Texas A&M University. He received his PhD degree in materials science and engineering from Johns Hopkins University (JHU) in 2015. He then held a dual postdoctoral appointment at JHU and Arizona State University. His current research focuses on utilizing self-organization to develop new nanostructured metallic materials, and characterizing their mechanical behavior. In 2014, He received a Materials Research Society

Silver Graduate Student Award.