Materials Science and Engineering Department

Spring Seminar Series

Additive Manufacturing: Machine Learning, Mechanics, and Metallurgy

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May 29, 2024
11AM-12PM | Hill Seminar Room (LeBow 240)

The thermal histories in laser-based additive manufacturing (AM) of metal alloys results in microstructures that may contain phases, grain morphologies, or internal pores different from those seen in their conventionally processed counterparts. These microstructures dictate the resulting mechanical properties of the alloys; thus, to enable the adoption of AM for structural applications, an understanding of the links between microstructure and deformation and/or fracture is required to reliably design against failure. In this talk, I will present our work in three general areas: using in situ process monitoring to link processing signatures to defects and mechanical properties, modeling the impact of internal defects on the multiaxial failure behavior of additively manufactured metallic materials, and the development of a framework for designing functionally graded materials in which the composition is spatially tailored to impart site-specific properties within a 3D component.

Prof. Allison Beese received her B.S. in Mechanical Engineering from Penn State University. She then worked as an engineer at Knolls Atomic Power Laboratory before entering graduate school. She earned her M.S. and Ph.D. in Mechanical Engineering from the Massachusetts Institute of Technology (MIT). As a graduate student, she worked in the Impact and Crashworthiness Lab, where she focused on experimentally measuring and computationally modeling the multiaxial deformation and fracture of advanced high strength steels. After graduation, she became a postdoctoral fellow at Northwestern University in the Nano and Micromechanics Lab, where she performed experiments on materials ranging from carbon-based fibers and sheets to biological cells using a range of techniques including microelectromechanical systems (MEMS)-based testing techniques in situ a transmission electron microscope (TEM). She joined Penn State's Department of Materials Science and Engineering in 2013, and also holds a courtesy appointment in the Department of Mechanical Engineering.
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