**Materials Seminar**

Department of Materials Science & Engineering

# Monday March 19, 2018

3:30 – 4:30 ~ 525 Min Kao Bldg

Faculty Candidate

"Corrosion of Selective Laser Melted Additive Stainless Steels: How Stainless Are They?"

**Speaker:** **Dr. Eric Schindelholz**



Materials Science & Engineering Staff Scientist

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Abstract:

Additive manufacturing (AM) is of tremendous interest for producing parts with sophisticated, non-traditional 3D geometries from engineered structural materials. Selective laser melting (SLM) is a prevalent metal AM process whereby a laser is used to melt a pattern in successive layers of powder material to build a part. Locally high cooling rates with highly non-equilibrium and directional solidification conditions during SLM result in microstructures considerably different from their conventionally processed counterparts. Although the linkage between processing, microstructure and mechanical properties of AM metals has received considerable attention, the corrosion performance of these materials is relatively unexplored – a critical factor for their use in many service environments. In this talk, we will discuss current efforts aimed at understanding how the unique features of SLM stainless steels affect corrosion resistance relative to their conventionally processed counterparts. The electrochemical behavior of SLM 17-4 PH and 304L will be addressed within the context of hierarchal microstructural and surface features governing corrosion across multiple length scales. This includes the deleterious role of lack of fusion porosity, a common SLM feature, and the surprising discovery of exceptional pitting resistance of SLM 304L and its relationship to ultrafine inclusions. Regarding the latter, the development of advanced high-resolution approaches for linking microstructure to corrosion processes, such as in-situ electrochemical transmission electron microscopy, are being developed. Based on these studies, processing and post-processing targets for enhanced corrosion resistance are addressed along with areas for future work.

Biography:

Eric Schindelholz is a senior staff scientist in Materials Science and Engineering at Sandia National Laboratories, since 2014. His present work includes basic research in atmospheric corrosion, stress corrosion cracking of nuclear used fuel waste canisters, corrosion of emergent metal materials and development of nanocomposite corrosion barrier films. He received his PhD in Materials Science and Engineering from the University of Virginia in 2014 and was awarded The Electrochemical Society’s 2015 Morris Cohen award for his contributions to corrosion science. Prior to obtaining his PhD, Eric worked as a corrosion expert on historic monuments and museum artifacts for both private and federal institutions.