PURDUE UNIVERSITY | School of Nuclear Engineering

Nuclear Engineering Seminar

Dr. Xiaoyuan Lou

Auburn University – Associate Professor

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Metal Additive Manufacturing for Nuclear – Qualification, Materials, and Beyond

Abstract

Metal additive manufacturing (AM) provides the opportunity to revolutionize the design and fabrication of complex components for advanced reactor applications. This technology offers great advantages to nuclear industry, including improved design and material functionality, fast delivery of repair hardware, rapid prototyping, through-life supply chain, the construction of multi-material structures, etc. This talk highlights our continuing efforts to qualify and develop AM process and materials for advanced fission and fusion applications, and utilize AM to overcome the grant challenges central to the costly and time-consuming nuclear alloy development and qualification. In particular, the talk will discuss two technical topics, including (1) understanding a puzzling phenomenon of irradiation-assisted stress corrosion cracking (IASCC) of 316L stainless steel (SS) made by laser AM; (2) developing radiation and cracking resistant stainless steel for nuclear environments. These work establish the technical basis to support the development of ASME code case for AM, and provide advanced alloy design concepts to future reactor applications.

Xiaoyuan Lou is an Associate Professor in Materials Engineering at Auburn University. He earned his Ph.D. in materials science and engineering from Georgia Institute of Technology. Before joining Auburn, he was a lead material scientist at GE Global Research in Niskayuna, NY. Dr. Lou's work involves developing advanced alloys and manufacturing methods for nuclear applications, and understanding the degradation mechanisms of nuclear alloys exposed to high temperature, corrosion, and radiation. His research interests mainly focus on environment-assisted cracking, irradiation assisted stress corrosion cracking, creep, metal additive manufacturing, advanced corrosion resistant alloys and composites, and high -throughput alloy development. Dr. Lou was recognized with "Best Paper Award" by Journal of Nuclear Materials, "Top Cited Paper" by International Journal of Plasticity and Journal of Nuclear Materials, and three GE Corporate awards. He also received the Outstanding Faculty Teaching Award from Auburn University Samuel Ginn College of Engineering.