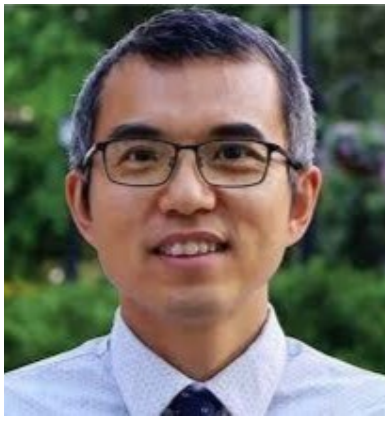
PURDUE UNIVERSITY | School of Nuclear Engineering

Nuclear Engineering Seminar

Dr. Xiaoyuan Lou,

Associate Professor, Purdue University



Wednesday, February 5, 2025
3:30 pm | FRNY G140

Qualifying Laser Additive Manufacturing for Nuclear Use

Abstract

Metal additive manufacturing (AM) revolutionizes the way to manufacture small- and medium-size nuclear components, support in-factory modular assembly, reduce the welding operations, performance enhancement and cost/time saving. This talk highlights our efforts to qualify laser additively manufactured 316L and 316H stainless steel (SS) for nuclear adoption in the past 6 years. While the talk will cover different reactor types (light-water and GEN IV), manufacturing methods (laser powder bed fusion and direct energy deposition), and material degradation modes (environmental cracking, irradiation-assisted stress corrosion cracking and high-temperature creep), the goal is to give a comprehensive review of our current understandings of microstructure-property relationship in nuclear perspectives to support code qualification and regulatory approval. A robust understanding of the process-structure-property relationships is the fundamental for reliable AM qualification. Mechanisms regarding the effects of AM microstructure on radiation damage, SCC , IASCC, and creep-rupture are discussed.

Xiaoyuan Lou is an associate professor in Nuclear Engineering at Purdue University. He earned his Ph.D. in materials science and engineering from Georgia Institute of Technology. Before joining Purdue, he was an associate professor at Auburn University and a lead material scientist at GE Research. Dr. Lou's work involves understanding the degradation mechanisms of nuclear alloys, and developing advanced manufacturing methods and alloys for extreme environments. Dr. Lou was recognized with two times for "Best Paper Award" by Journal of Nuclear Materials, "Top Cited Paper Award" by International Journal of Plasticity, three GE Corporate awards, Outstanding Faculty Teaching Award from Auburn University College of Engineering, and Paul C. Zmola Scholar of Nuclear Engineering Award from Purdue Nuclear Engineering.