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Additive Manufacturing of Metal Parts for Extreme Environments

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Zoom Meeting
https://oklahoma.zoom.us/j/99214961549?pwd=OGhUWkxMZnIkWUpsUUVDbFJENmJJdz09

Meeting ID: 992 1496 1549 Passcode: 65558891

Thursday, September 23, 2021, 9:00 a.m. – 10: 15 a.m.

Additive manufacturing (AM) has demonstrated to be a unique means for rapidly and remotely building customized, complex metallic parts for a variety of engineering applications within the energy, aerospace, biomedical and automotive industries. For the energy sector, there is an emerging interest in using AM to fabricate customized components for enhancing the efficiency and overall manufacturability of modular (very small) nuclear power plants. This talk will focus on describing the opportunities and challenges associated with metals AM for critical, 'extreme' applications such as nuclear power cycles. The process-structure-property-performance relationships inherent to laser-powder bed fusion (L-PBF) AM methods, nickel-based superalloys, and microstructure, residual stress and porosity will be discussed. Results demonstrating the effects of nuclear and ion radiation on L-PBF metal hardness and microstructure will be shown.

Scott M. Thompson is a Steve Hsu Keystone Associate Professor in the Alan Levin Department of Mechanical & Nuclear Engineering in the Carl R. Ice College of Engineering at Kansas State University (KSU). He received both his B.S. and Ph.D. in Mechanical Engineering from the University of Missouri (MU) in 2008 and 2012, respectively. Dr. Thompson's research focuses on modeling the metals additive manufacturing (AM) process and in characterizing such parts (microstructure, properties, residual stress) before/after nuclear environmental exposure. He also performs research on heat exchanger design, heat pipes, heat transfer, energy harvesting, passive flow control, and more. His research efforts have led to 50+ published/peer-reviewed journal articles, 2 book chapters, and 80+ conference proceedings and presentations. He has helped secure and lead several externally-funded research projects (>$ 3 Mil) from agencies such as the DoD, DoE, DARPA, NSF, and NASA. Thompson is a senior member of the AIAA and ASME. He continues to co-organize the annual ASME IMECE Symposium on AM and is currently the Chair of ASME's K13 Committee on Heat Transfer in Multiphase Systems.