

Exploring the Symbiotic Relationship between Additive Manufacturing, Materials Processing, Surface Engineering and Tribology

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Abstract:

Additive manufacturing (AM) has revolutionized the manufacturing world in the past decade and became an important driver for next generation engineering design and innovation. The development of metal AM has made great progress, but it still faces unique processing and materials development challenges. Out of seven major metal AM technologies Directed Energy Deposition (DED) offers unique advantages such as development of functionally graded components which can have enhanced surface and core material properties that is not possible to achieve via traditional casting or wrought routes. DED is popular due to its metal component repair technology and ability to fabricate large-scale components, such as automotive metal stamping, tools, dies, and face sheets for aerospace tooling. On the other hand, tribology, a complex and highly interdisciplinary field, is the science of friction, wear, and lubrication. Surface engineering is connected to materials science as it pertains to the surface of solid matter. Additive manufacturing, materials processing, surface engineering, and tribology have an interdependent relationship. This talk will address ways to leverage this perspective to develop next-generation functional components with enhanced reliability when encountering variety of operating environments in a range of application sectors, challenges on generating reliable mechanical behaviors of large-scale metal AM parts using state of the art metal Big Area Additive Manufacturing (mBAAM) technique at Oak Ridge National Laboratory, the advanced materials processing routes to overcome those challenges, and the capability of laser powder DED-based cladding on reducing frictional behavior of engine components.

Biography:

Dr. Sougata Roy is an assistant professor in the Department of Mechanical Engineering at University of North Dakota. He has been directing multiple projects funded by federal agencies such as US Navy, NSF, NASA, and different state agencies in the fields of multiscale metal additive manufacturing, advanced materials processing, surface engineering and tribology. Dr. Roy was the recipient of the Early Career Award in 2018 from the Society of Tribologists and Lubrication Engineers (STLE) where he served Program Selection Committee Chair for Surface Engineering technical committee in STLE Annual Meeting 2022. Dr. Roy is the lead organizer for the symposium titled 'Additive Manufacturing of Large-scale Metallic Components' in TMS 2023, and a member of 2023 editorial advisory board for Tribology and Lubrication Technology (TLT) Magazine. Prior to joining his current institution in August 2020, Dr. Roy was a Postdoc in Materials Science and Technology Division at Oak Ridge National Laboratory for two years. Dr. Roy received his Ph.D. with major in Mechanical Engineering and minor in Materials Science and Engineering from Iowa State University in 2018 and worked at Cummins Inc. for a year before joining his doctoral study. He received his M.S. from Indian Institute of Technology Madras and B.S. from West Bengal University of Technology, India both in Mechanical Engineering.

***This seminar counts towards the ME 600 seminar requirement for Mechanical Engineering graduate students.**

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