

SEPTEMBER 2, 2025 | 11-12 AM | HRC-153

SCHOOL OF
MATERIALS, MECHATRONICS AND MANUFACTURING ENGINEERING
College of Engineering, Architecture and Technology

MMME SEMINAR SERIES

Additive Manufacturing of a SiC based Heat Exchanger for Harsh Environments

DILEEP SINGH, PH.D.

Dr. Dileep Singh is an Argonne Distinguished Fellow and Director of Materials for Harsh Environments department at Argonne National Laboratory. His current research interests include thermal energy storage, innovative manufacturing, and advanced synchrotron x-ray characterizations. He is a winner of several awards, including three R&D 100 awards, James Mueller award (American Ceramic Society), the Federal Laboratory Consortium award for technology transfer, Argonne's Director's award for Outstanding Achievement. He is a Fellow of the ASM International and American Ceramic Society and is an Academician of the World Academy of Ceramics. He has over 180 publications and 33 US and international patents. He is an inventor of the phosphate-bonded ceramics (Ceramicrete®) technology that has been commercialized. He currently serves on the Board of the American Ceramic Society. He received his Ph. D. in Materials Science and Engineering from the University of Utah and has completed the Strategic Laboratory Leadership Program from the University of Chicago.



ABSTRACT

Harsh environments and operating conditions of power generation from renewable energy sources is necessitating development of components and systems using advanced materials. Attributes of ceramics and their composites that make them the materials of choice are their high-temperature mechanical properties, corrosion and creep resistance, etc. This presentation will discuss the opportunities for ceramics and composites specific to concentrated solar-thermal power. One specific application is the need for a high-temperature heat exchanger that can operate above 700°C and up to 20 MPa fluid pressures for efficient heat transfer in the future concentrating solar power plants. At these temperatures and pressures, metal heat exchangers degrade in structural performance. In this presentation, design and development of a SiC-based heat exchanger using binder jet based additive manufacturing technique will be discussed. Results on heat transfer testing of the fabricated SiC heat exchanger prototypes will presented. Finally, on-going efforts in the process scale-up of the ceramic heat exchanger will be highlighted.

PIZZA PROVIDED

ZOOM MEETING