SOUTH DAKOTA MINES
Department of Mechanical Engineering

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THURSDAY, OCTOBER 7 2:00-2:50PM CM266

ME Research Seminar

Microstructure & Mechanical Properties of Cold Spray Deposited GRCop-42 & HR-1 Alloys

TERRENCE KUCA
Ph.D. Student
Department of Mechanical Engineering
South Dakota Mines

THURSDAY 10/7 2-2:50 PM CM266
followed by social at 3pm in CM 215
(The ME Zoo) with light refreshments

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The main objective of this work is to investigate the microstructure and mechanical properties of GRCop-42 and HR-1 deposits produced using a high-pressure cold spray process. GRCop-42 (Cu-4 at.% Cr-2 at.% Nb) is a copper-based alloy with excellent elevated temperature strength, good creep resistance, and higher oxidation resistance. It also has a lower thermal expansion than many other copper-based alloys. HR-1 is a high-strength Fe-Ni-base superalloy with excellent oxidation and corrosion resistance and exceptional hydrogen embrittlement resistance. The bimetallic joints of GRCop-42 and HR-1 alloys can be used for several applications in rocket engine components, such as combustion liners, jackets, and nozzles, where high-temperature strength and high heat flux are needed. Additive manufacturing of these components will lower manufacturing costs, reduce build time, and increase flexibility in designing and manufacturing new components for various applications.

Speaker Bio:
Terrence Kuca is a Ph.D. student in Mechanical Engineering at South Dakota Mines, in Dr. Diwakar's and Dr. Jasthi's Labs. His current research focused on experimenting, modeling, and simulating dust explosions using computational fluid dynamics (CFD). Terrence is interested in understanding, preventing, and controlling dust explosions, a significant safety concern for mining operations, factories, and even space travel. His interests include physical experimentation, numerical methods, computational fluid dynamics, combustion engineering, heat transfer, and gas dynamics. Terrence interned at VRC Metal Systems, working in research and development of spray nozzle cooling systems and designing new high-pressure cold spray nozzles. He has a BS and MS in Mechanical Engineering from South Dakota Mines.