SOUTH DAKOTA MINES
Department of Mechanical Engineering

THURSDAY, OCTOBER 1 2:00-2:50 PM

ME Research Seminar

An Improved Performance Metric for Comparing Magnetocaloric Solid Refrigerants Undergoing First-Order Magnetostructural Transitions

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SOUTH DAKOTA MINES

Dr. Bruno joined the Department of Mechanical Engineering at South Dakota Mines as an Assistant Professor in 2017. Since then he has been awarded two Faculty Fellowships from NASA Glenn Research Center in Cleveland, Ohio and has ongoing research collaborations with them in magnetic materials processing and manufacturing. Dr. Bruno previously worked as a Process TD Engineer at Intel Corporation and earned his PhD from Texas A&M University (2015) with a dissertation topic on the magneto- and elastocaloric effects in metamagnetic shape memory alloys. Prior to earning his PhD, he earned a M.S. degree at Northern Arizona University (2011) with a thesis topic on harvesting waste mechanical energy with the martensite variant reorientation mechanism commonly observed in NiMnGa magnetic shape memory alloy single crystals.

THURSDAY 10/1 2-2:50 PM
in-person: CM 266 (capacity 16)
Live *Zoom!* LINK: tiny.cc/MinesF20

Talk abstract
In recent years, residential and commercial heating and cooling appliances consume nearly 40% of the United States' produced energy through low-efficiency vapor-compression cooling units. Moreover, vapor-compression systems have the potential to deplete ozone when refrigerants are leaked. Solid-state refrigeration driven by the magnetocaloric effect (MCE) may offer a solution to these issues. MCE cooling technology has been around since the early 1980's, and a few metrics have been developed to compare the refrigeration performance of conventional ferromagnetic coolants around their Curie point (i.e. second-order thermodynamic transitions). Since then, novel materials have been developed that exhibit first-order magneto-structural transitions and simultaneous transformation latent heat. Here, we impose thermodynamic bounds on a MCE performance metric and apply the metric to a family of meta-magnetic shape memory alloy solid-refrigerants to identify the best performing candidates for cooling applications.