SOUTH DAKOTA MINES
Department of Mechanical Engineering

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THURSDAY, OCTOBER 14 2:00-2:50PM CM266

ME Research Seminar

Microstructural Processing & Phase Stabilization Analysis of Off-Stoichiometric Fe-Mn-Ga Shape Memory Alloy

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Speaker Bio:
Nana Adoo is a Ph.D. student in Materials Engineering & Science at South Dakota Mines. Since 2019 he has worked on ferromagnetic shape memory alloys in Dr. Bruno's Laboratory of Engineering Multifunctional Materials and Alloys (LEMMA) in the Department of Mechanical Engineering. Nana has experience in reactor neutronics, nuclear thermal hydraulic systems and materials. He has also conducted research in reactor natural circulation flow and neutronics simulations with peer reviewed publications. Nana holds Bachelor's and Master's degrees in Physics with Materials Science emphasis and Nuclear Engineering from Ghana.

THURSDAY 10/14 2-2:50 PM CM266
followed by social at 3pm in CM 215
(The ME Zoo) with light refreshments

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Metamagnetic shape-memory alloys (MSMA) are a group of Heusler materials which have gained attention due to their multifunctional capabilities derived from their wide-range tunable thermal, magnetic, electrical, and structural/mechanical properties. These unique characteristics are largely associated with reversible martensitic transformation (MT) and metamagnetic phase transition resulting in large magnetic field-induced strains (MFIS) and pseudoelasticity correlated to a large inverse Magneto-caloric Effect (MCE), making them highly useful in devices such as energy harvesters, sensors (actuators), among others. Despite their multifunctionality, fabrication of these materials is challenging because they are brittle and a non-transforming phase stabilizes with slow cooling. FeMnGa MSMAs have been shown to exhibit higher ductility and better overall energy conversion capabilities compared to NiMn-based SMA. However, FeMnGa SMAs are characterized by large transformation hysteresis due to the stabilization of mixed microstructural phases, which may interrupt the reversible phase transition. This work aims to investigate this ternary alloy and identify the right composition and stable microstructures that will guarantee low transformation hysteresis and enable the alloy to contend for future engineering applications.