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ANAHEIM CONVENTION CENTER & ANAHEIM MARRIOTT
ANAHEIM, CALIFORNIA, USA
#TMSAnnualMeeting

SUBMIT AN ABSTRACT FOR THE FOLLOWING TMS2022 SYMPOSIUM:

ENERGY & ENVIRONMENT

Magnetics and the Critical Materials Challenge: An FMD Symposium Honoring Matthew J. Kramer

The increasing need for improved energy efficiency in numerous technologies drives the need for the development of advanced magnetic metals. Improvements in hard and soft magnetic materials are essential to enabling high-efficiency energy conversion technologies such as compact motor-generators. Similarly, caloric materials show great promise for increased cooling efficiency and longer operational lifespans, while eliminating greenhouse gases.

Beyond improved performance, these materials must also address critical materials challenges—where supply chain uncertainty can hamper widespread commercialization. For example, high-performance magnetic and magneto-responsive materials typically rely on rare earth elements, which are subject to supply/demand instability leading to dramatic changes in price. Disruption of the Nd supply in 2011 led to an increase in price by a factor of ten. Other technologies are enabled by minor metals such as gallium which is a co-product from aluminum mining. Demand for Ga is rapidly growing within the semiconductor industry (GaN), limiting its availability and increasing the cost for applications such as Galfenol—a magnetostrictive material. There is a clear need to develop classes of advanced magnetic materials with decreased reliance on critical elements.

Addressing this challenge requires developing new synthesis approaches for structures difficult to realize and advanced characterization to identify and optimize material performance. Synthesis techniques include pathways to:

- Obtain and retain metastable phases and/or nanostructures in complex systems
- Scale-up synthesis to bulk geometries while maintaining non-equilibrium phases/structures
- Precise control over chemistry, texture, and defects during synthesis.

Equally important is advanced characterization of functional materials including:

- Advanced electron microscopy characterization of atomic- and nano-scale structures
- In situ characterization (X-ray, neutron, etc.) of phase stability in complex systems
- Physical property measurements

This symposium will cover all aspects of advanced synthesis and characterization of high-performance functional materials. Specific topics of interest will include permanent magnet materials (rare earth and rare earth free), soft magnetic materials, calorics (magneto and elasto), and magnetostrictive materials.

ORGANIZERS

Scott McCall, Lawrence Livermore National Laboratory
Ryan T. Ott, Ames Laboratory

SYMPOSIUM SPONSORS

TMS Magnetic Materials Committee

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QUESTIONS?
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