

Abstract Submitted
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First Successful Fabrication of Nanoparticles of magnetocaloric Gd_5Si_4 ¹ RAVI L. HADIMANI, Iowa State Univ, SHALABH GUPTA, Ames Laboratory, US Dept. of Energy, SHANE M. HARSTAD, VITALIJ K. PECHARSKY, DAVID C. JILES, Iowa State Univ, IOWA STATE UNIVERSITY COLLABORATION, AMES LABORATORY, US DEPT. OF ENERGY COLLABORATION — The $\text{Gd}_5(\text{Si}_x\text{Ge}_{1-x})_4$ system has been widely studied in bulk form due to its interesting properties at the phase transition. There are a few reports on the fabrication of thin films of this material but, there are no reports in the literature on synthesis and characterization of nanoparticles of this material. Unlike films, which are expected to have low refrigeration capacity due to low volume, nanoparticles have the potential to overcome the problem if a scalable and cost-effective method of nanoparticle fabrication can be developed. In this work, we have synthesized sub-micron particles of Gd_5Si_4 by high-energy ball-milling varying milling times and milling intensity. We have investigated their microstructure, crystal structure, composition and magnetic properties. We have determined the milling time beyond which the particles become non-crystalline and lose the long range ordering. We also show that the coercivity of the particles increases with increasing the milling time. Particles agglomerate at long milling times and the particles that are milled longer than 20 min no longer undergo magnetic phase transition close to 340 K, which is present in a bulk material.

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