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Effect of Milling Time on the Blocking Temperature of Nanoparticles of Magnetocaloric Gd_5Si_4. RAVI HADIMANI, Iowa State University, SHALBH GUPTA, Ames Laboratory, US Department of Energy, SHANE HARSTAD, Iowa State University, VITALIJ PECHARSKY, Ames Laboratory, US Department of Energy, DAVID JILES, Iowa State University, DAVID C JILES TEAM, VITALIJ PECHARSKY COLLABORATION — Extensive research has been done on giant magnetocaloric material $Gd_5(Si_xGe_{1-x})_4$ to improve adiabatic temperature/isothermal entropy change. However, there have been only a few reports on fabrication of nanostructure/nanoparticles that can be used to tune various properties by changing the length scale. Recently we have reported fabrication of room temperature ferromagnetic nanoparticles of Gd_5Si_4 using high energy ball milling. These nanoparticles have potential applications in biomedical engineering such as better T_2 MRI contrast agents and in hypothermia. Here we report the effect of milling time on the blocking temperature, micro-structure, crystal structure, and magnetic properties of these nanoparticles. Magnetization vs. temperature at an applied field of 100 Oe is measured for all the ball milled samples. Bulk Gd_5Si_4 has a transition temperature of $\approx$340 K. There are two phase transitions observed in the nanoparticles, one near 300 K corresponding to the Gd_5Si_4 phase and another between 75-150 K corresponding to Gd_5Si_3. Zero Field Cooling (ZFC) and Field Cooling (FC) were measured. The blocking temperatures for the nanoparticles increase with decrease in milling time.

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