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Magnetocaloric Effect in Nanoparticle Systems and Clathrates
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We report the magnetocaloric effect (MCE) in cobalt ferrite, manganese ferrite, and nickel ferrite nanoparticle systems and also the first observation of a large MCE in $Eu_8Ga_{16}Ge_{30}$ clathrate compounds. The ferrite nanoparticles were synthesized using organometallic precursors in a wet chemical technique and characterized by XPS and XRD. Change in entropy (ΔS^{mag}) was calculated using the Maxwell relation from the family of M-H curves at different temperatures. The maximum entropy change in these nanoparticle systems is influenced by the particle size, overall distribution in anisotropy, and moments. Even though the entropy change for these nanoparticles is reasonably large in comparison to previous reports, it is much smaller in comparison to the bulk systems exhibiting giant MCE. We also investigated MCE in a bulk clathrate system and observed large entropy changes of 6 and 9.3 J/kg-K for the Type I and Type VIII clathrate phases, respectively. These results indicate that the clathrates known to possess excellent thermoelectric properties are also promising candidates as magnetic refrigerant materials. HS acknowledges support from NSF grant CTS-0408933

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