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Volume Dependence of Thermoinduced Magnetization in Antiferromagnetic Nanoparticles[1] GREGORY BROWN, Oak Ridge Natl Lab, ANDERSON JANOTTI, UC Santa Barbara, MARKUS EISENBACH, G. MALCOLM STOCKS, Oak Ridge Natl Lab — Monte Carlo methods have been applied to classical Heisenberg models to study the thermoinduced magnetization in nanoparticles of antiferromagnetic materials. In the presence of uniaxial anisotropy, the average magnetization per spin of the individual particles is found to decrease as approximately the square-root of the particle volume, $M \sim V^{-1/2}$, which is significantly different from the $M \sim V^{-1}$ predicted by a recent theory [S. Mørup and C. Frandsen, Phys. Rev. Lett. **92**, 217201 (2004)]. The exact value of the exponent depends on the strength of the uniaxial anisotropy, and approaches $-1/2$ from below as the strength of the anisotropy increases. In addition, the magnitude of the thermoinduced magnetization decreases as the strength of the anisotropy increases, and it vanishes in the infinite anisotropy, i.e. Ising, limit. This indicates that spin-waves are essential to thermoinduced magnetization.

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