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Effect of Dipolar Interactions on the Magnetization of Single-Molecule Magnets in a cubic lattice[1] MARISOL ALCANTARA ORTIGOZA, RICHARD A. KLEMM, SERGEY STOLBOV, TALAT S. RAHMAN, Kansas State University — Since the one-body tunnel picture of single-molecule magnets (SMM) is not always sufficient to explain the fine structure of experimental hysteresis loops, the effect of intermolecular dipolar interactions has been investigated on an ensemble of 100 3D-systems of 5X5X4 particles, each with spin S = 5, arranged in a cubic lattice. We have solved the Landau-Lifshitz-Gilbert equation for several values of the damping constant, the field sweep rate and the lattice constant. We find that the smaller the damping constant is, the stronger the maximum field needs to be to produce hysteresis. Furthermore, the shape of the hysteresis loops also depends on the damping constant. We also find that the system magnetizes and demagnetizes faster with decreasing sweep rates, resulting in smaller hysteresis loops. Variations of the lattice constant within realistic values (1.5nm and 2.5nm) show that the dipolar interaction plays an important role in magnetic hysteresis by controlling the relaxation process. Examination of temperature dependencies (0.1K and 0.7K) of the above will be presented and compared with recent experimental data on SMM.

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