Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Structural, Magnetic and Dynamical Properties of Dipolar Nanoparticles PETER ENTEL, STEPHAN BUSCHMANN, ALFRED HUCHT, Theoretische Physik, Universitt Duisburg-Essen, D-47048 Duisburg — We investigated the structural, magnetic and collective properties of dipolar nanoparticles. The dynamic of the systems is determined by differential equations for the translational and rotational degrees of freedom, which are studied using molecular dynamics. The interaction potential of the particles consists of both an anisotropic dipolar interaction and an isotropic hard-sphere potential. Dependent on the temperature and external magnetic field, the system is found to be in different states. These states can be characterized by their respective structural ordering, that is closely related to the magnetic and energetic properties of the assembly of particles. In the ground state the particles arrange themselves in closed rings due to the anisotropic nature of the interaction. Besides this structure also the formation of metastable chains and network-like structures can be observed. Thermal excitations lead to a destabilization while the influence of an external magnetic field depends on its relative orientation with respect to the structures. In this work the phase diagrams in two and three dimensions of the various structures are determined as a function of temperature and external field.

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Date submitted: 07 Dec 2005 Electronic form version 1.4