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Finite size effect in shell nanoparticles JOSHUA KOCH, RENAT SABIRIANOV, University of Nebraska Omaha — The magnetic properties of single layer shell particles studied as function of the particle's size using Monte Carlo method with free boundary conditions. We formed truncated octahedron shell-nanoparticles of 4-30 lattice spacings across mimicking particles from 2-12 nm in size. The classical Heisenberg model with nearest neighbor ferromagnetic (FM) and antiferromagnetic (AFM) exchange interactions shows the existence of the well defined ground state. FM nanoparticles have susceptibility maximum decreasing with the increase of the nanoparticle size. Finite size scaling analysis predicts small Curie temperature for shells of the large size. The AFM particles built as truncated octahedron with (001) and (111) planes of the cubic lattice show freezing in the noncollinear structure with very low magnetization. The freezing temperature determined as maximum in specific heat in particles with AFM does not change strongly with the size of the shell in the studied particle sizes. We clearly observe the effects of edges and corners on the properties of shell particles resulting in deviation from simple scaling behavior. We fit the size dependence variation of thermodynamic properties maxima using the idea of the continuous dimensionality and the fact that infinite 2D systems do not exhibit long range order at finite temperature in the continuous symmetry.

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