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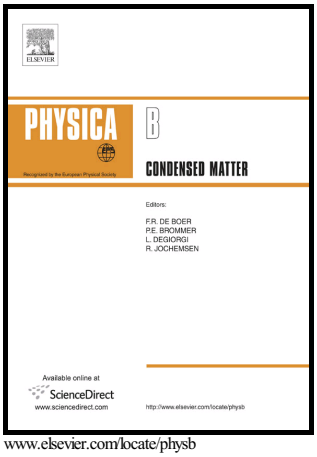

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Magnetic behaviors of a transverse spin-1/2 Ising cubic nanowire with core/shell structure

by

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Abstract

The surface shell exchange coupling effect on the magnetic properties (surface shell, core, total longitudinal and total transverse magnetizations, susceptibility, phase diagram and hysteresis loops) of a transverse spin-$\frac{1}{2}$ Ising cubic nanowire is investigated, in the present work, by employing the effective-field theory based on the probability distribution technique with correlations, for both ferro- and antiferromagnetic cases. We have found that this parameter has a strong effect on the magnetic properties in both cases. In the ferromagnetic case, the total longitudinal magnetization curves display Q- and S-type behaviors and the hysteresis loop has just one loop, whereas in the antiferromagnetic case, the N-type behavior, in which one compensation temperature appears below the critical temperature, exists in the total longitudinal magnetization curve versus reduced temperature, and triple hysteresis loops are found. The effect of applied field is also investigated on the total longitudinal magnetization for the both cases, and we have found that a large applied field value can overcome the antiferromagnetic coupling leading to a ferromagnetic-like behavior.