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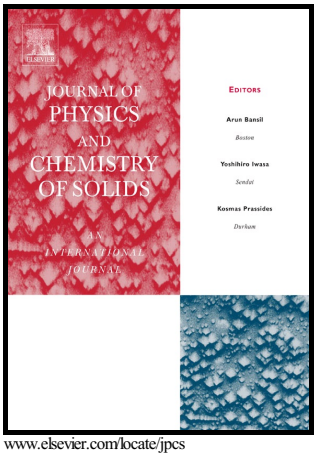

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Monte Carlo study of magnetic and thermodynamic properties of a ferrimagnetic Ising nanoparticle with hexagonal core-shell structure

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Abstract

The Monte Carlo method has been used to study the magnetic and thermodynamic properties of a hexagonal ferrimagnetic Ising nanoparticle with spin-3/2 inner core surrounded by spin-1 surface shell layers. The effects of exchange couplings and crystal-fields on the compensation behaviors and critical phenomena of the system have been investigated in detail. Many types of the magnetization curves have been found, depending on the competitions among the exchange couplings, the crystal-fields and the temperature. The phase diagrams for different exchange couplings and crystal-fields have been also obtained. In Particular, we have discovered the double and triple hysteresis loops for certain physical parameters in the present system. An excellent agreement has been achieved from the comparison between our results and the previous studies.

Keywords:

Monte Carlo method, Nanoparticle, Critical phenomenon, Compensation temperature, Hysteresis loops

1. Introduction

In recent years, magnetic nanoparticles have aroused considerable interests due to