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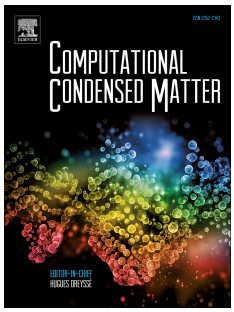

Magnetic properties of a mixed spin Ising nanowire with inner core, inter core-shell and outer shell morphology

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Magnetic properties of a mixed spin Ising nanowire with inner core, inter core-shell and outer shell morphology.

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Abstract

Monte Carlo simulation has been used to study the magnetic and thermodynamic properties of a hexagonal ferrimagnetic Ising nanowire with spin-1/2 inner core surrounded by spin-1 inter core-shell and spin-1/2 outer shell. The effects of the exchange couplings and crystal field on the critical and compensation behaviors of the system have been investigated. Many types of the magnetization curves have been found such as N-, P-, Q-, R- and W-types. The phase diagrams and hysteresis behavior have been also obtained. In addition, double and triple hysteresis loops have been found around the compensation temperature for certain values of the Hamiltonian parameters.

Keywords: Nanowire; Monte Carlo simulation; Phase diagrams; Compensation temperature; Hysteresis behavior.

1. Introduction

Du to their potential technological applications [1, 2, 3, 4, 5], growing interest is continuously directed towards the study of the magnetic properties of nanoparticles, nanoislands and nanowires. From the theoretical point of view, these systems have been studied using some techniques like mean field theory [6, 7], effective field theory (EFT) [8, 9], Monte Carlo simulation [10, 11, 12, 13, 14, 15, 16, 17, 18, 19], variational cumulant expansion [20, 21], and Green's function formalism [22].

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