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Magnetic properties in stacked triangular lattice: Monte Carlo approach

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Abstract:

We study the magnetic properties of mixed spins $\sigma=5/2$ and $S=2$ Ising in stacked triangular lattice (STL) using Monte Carlo approach. We have also give the grounds state phase diagrams of mixed spins-5/2 and 2. The different magnetic phases are detected under effect of different physical parameters. The diagrams show some key features: coexistence between regions, points where three, four and five states can coexist. The reduced critical temperatures have been also determined for different exchange interactions in each layer with a fixed value of exchange interactions between two layers. The total magnetization with reduced exchange interactions and crystal-fields of mixed spins is obtained. The multiple hysteresis and the superparamagnetic behaviour are established around the reduced critical temperatures. The magnetic coercive field and magnetization remanent increase with increasing the exchange interactions and decreases with increasing the temperature values. The obtained results are similar to those obtained by experiment and theoretically results. Above reduced transition temperature the system shows superparamagnetic behavior which makes the material desirable for biomedical applications.

Keywords: Stacked triangular lattice; Ising model; Monte Carlo simulations; Critical temperature; Multiples hysteresis cycle; Magnetic coercive field and magnetization remanent.

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