Republic of Iraq
Ministry of Higher Education
& Scientific Research
AL- Muthanna University
College of Science
Department of Physics

A study of anisotropic fields on magnetic compensation phenomenon of a decorated mixed ferrimagnetic lattice system

A Thesis Submitted to the Council of College of Science/AL Muthanna University as Partial Fulfillment of the Requirements for the Degree of Master of Sciences in Physics

BY

Shaima Hamid Mansour

B.Sc 2010

Supervisor

Prof. Dr. Hadey Kasim Mohamad

2022 A.D **1444 A.H**

ABSTRACT

In this study, spin compensation phenomenon has been studied using mean field approximation. It has been dealt with the framework of developed mean-field theory(DMFT) for a decorated ferrimagnet of two sublattices under Blume-Capel Ising model. Based on particular variations of the spin crystal fields for both interpenetrated lattices, novel features of long-range orders have been obtained in this research. For a decorated square lattice consists of spin-3/2 and decorating spin-5/2 ions on the bonds, it has been observed characteristic results. Many ferrimagnetic compensation temperatures were induced for the present system. Furthermore, two or rather more than three compensation temperatures induced in the decorated mixed spin square Blume-Capel system when the decorating crystal fields and magnetic fields are in the ranges $-1.5 \le D_B/|J_1| \le -0.5$, or $-0.25 \le h/|J_1| \le -0.05$, for $J_1 = -1.0$, $J_2 = -0.5$, giving a new behavior not classified in the Neel theory. It is worth to note that the contribution of total magnetization to the superparamagnetism phenomenon production of the decorated mixed spin ferrimagnet with $J_1 = -0.5$, $J_2 = -1.0$, has been indicated as well. The ferrimagnetic behaviors of our proposed model may be examined to clarify the characteristic behavior of the molecule-based magnetic material $Cs_2Mn^{II}[V^{II}(CN)_6]$ is prepared by the addition of manganese(II)($S_B = 5/2$) triflate to aqueous solutions of the hexacyanovanadate(II)($S_A = 3/2$) ion at 0^oC. It remains to mention that the results of this work should be fruitful for analyzing experimental data of molecular magnets. .