Accepted Manuscript

Phases diagrams and magnetic properties of tri-layer superlattices: Mean field study

S. Naji, A. Belhaj, H. Labrim, L. Bahmad, A. Benyoussef, A. El Kenz

PII: S0378-4371(13)01183-7
DOI: http://dx.doi.org/10.1016/j.physa.2013.12.042
Reference: PHYSA 14911

To appear in: *Physica A*

Received date: 5 August 2013
Revised date: 18 November 2013

Please cite this article as: S. Naji, A. Belhaj, H. Labrim, L. Bahmad, A. Benyoussef, A. El Kenz, Phases diagrams and magnetic properties of tri-layer superlattices: Mean field study, *Physica A* (2013), http://dx.doi.org/10.1016/j.physa.2013.12.042

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Phases Diagrams and Magnetic Properties of Tri-layer Superlattices: Mean Field Study

S. Naji[1,2], A. Belhaj[3], H. Labrim[4], L. Bahmad[1]*, A. Benyoussef[1,5,6], A. El Kenz[1]

[1] Laboratoire de Magnétisme et Physique des Hautes Énergies (LMPHE-URAC 12)

Faculté des Sciences, Université Mohammed V-Agdal, Rabat, Morocco

[2]Department of Physics, Faculty of Science, Ibb University, Ibb, Yemen

[3]Département de Physique, Faculté Polydisciplinaire, Université Sultan Moulay Slimane

Béni Mellal, Morocco

[4]Centre National de l'Energie, des Sciences et des Techniques Nucléaires, Rabat, Morocco

[5]Institute of Nanomaterials and Nanotechnology, MAScIR, Rabat, Morocco

[6] Hassan II Academy of Science and Technology, Rabat, Morocco

December 27, 2013

Abstract

Motivated by spintronic device applications, we engineer a superlattice model based on periodic tri-layers consisting of spins $\sigma = \frac{1}{2}$, $S = 1$ and $q = \frac{3}{2}$ residing on the sites of a square lattice, interacting with an external magnetic field. We study its phase diagrams and magnetic properties. We determine the corresponding ground state phase diagrams. Then, we show that this Ising lattice model exhibits a ferromagnetic phase F_1, two ferrimagnetic phases F_2, F_3 and an antiferromagnetic phase F_4. It is found that the magnetic behaviors depend on the moduli space controlled by the exchange interaction couplings. More precisely, the hysteresis loops have been established.

KeyWords: Super-lattice, Ising model, Magnetic properties, Mean field approximation.

Pacs numbers: 05.50.+q; 75.10.Hk; 75.40.Cx;75.70.Cn

*Corresponding author: bahmad@fsr.ac.ma

Download English Version:

https://daneshyari.com/en/article/7381706

Download Persian Version:

https://daneshyari.com/article/7381706

Daneshyari.com