05,11

Critical Behavior in Ga-doped manganites La$_{0.65}$Bi$_{0.05}$Sr$_{0.3}$Mn$_{1-x}$Ga$_x$O$_3$ ($x = 0$ and 0.06)

© M. Baazaoui[1], M. Oumezzine[1], W. Cheikhrouhou-Koubaa[2]

[1] Laboratoire de physico-Chimie des Matériaux, département de physique,
Faculté des Sciences de Monastir, Université de Monastir,
Monastir, Tunisie
[2] Laboratoire des technologies des Systémes Smart LT2S,
Centre de Recherche en Numérique de Sfax, Technopole de Sfax,
Sfax, Tunisie

E-mail: medbaazaoui@yahoo.fr

In this paper, we present a detailed study of the critical behavior around paramagnetic–ferromagnetic phase transition in the nominal composition La$_{0.65}$Bi$_{0.05}$Sr$_{0.3}$Mn$_{1-x}$Ga$_x$O$_3$ ($x = 0$ and 0.06). Our powder specimens were synthesized using the conventional solid-state reaction method and analyzed by X-ray diffraction and magnetic measurements. X-ray diffraction analysis at room temperature shows that our specimens La$_{0.65}$Bi$_{0.05}$Sr$_{0.3}$Mn$_{1-x}$Ga$_x$O$_3$ ($x = 0$ and 0.06) adopt a rhombohedra structure with R-3C space group. Based on Banerjee criterion, the positive slopes of the Arrott plot confirm the second order magnetic phase transition of our samples. The critical exponent values are calculated by distinct techniques like modified Arrott plot, Kouvel–Fisher method and critical isotherm. The determined critical exponents values are close to the 3D-Ising model. Furthermore, the substitution of Mn by Ga leads to the decrease of the critical exponent β and at the same time to the reduction of the Curie temperature T_C. The validity of the determined exponent values is authenticated using the scaling hypothesis, in which the $M(T, \varepsilon)$ curves integrate in two universal curves below and above T_C.

Keywords: Critical behaviour, Critical exponents, Arrott plot, Phase transition.