

Effect of the film thickness on the impedance behavior of sol–gel Ba_{0.6}Sr_{0.4}TiO₃ thin films

Abstract

Perovskite Ba_{0.6}Sr_{0.4}TiO₃ sol–gel thin films with different thicknesses are fabricated as MFM configuration to study the effect of the film thickness on the dielectric relaxation phenomenon and the ionic transport mechanism. The frequency dependent impedance, electric modulus, permittivity and AC conductivity have been investigated in this context. Z^* plane for all the tested samples shows two regions, corresponding to the bulk mechanism and the distribution of the grain boundaries–electrodes process. Electric modulus versus frequency plots reveal non-Debye relaxation peaks. The observed decrease in both the impedance and permittivity with the increase in film thickness is attributed to the grain size effect. The frequency dependent conductivity plots show three regions of conduction processes, i.e. low-frequency region due to DC conduction, mid-frequency region due to translational hopping motion and high-frequency region due to localized hopping and/or reorientational motion