

Correlation between the chemical composition and the conduction mechanism of barium strontium titanate thin films

Abstract

Sol-gel barium strontium titanate thin films with different barium-to-strontium (Ba:Sr) values have been fabricated as MFM configurations. The Perovskite phase for the films is confirmed via XRD. In order to correlate the effect of the chemical composition of the films with the conduction mechanism, different AC electrical parameters have been addressed. The results show that the impedance and dielectric constant decrease as Ba content in the film increases, whereas the conductivity shows the opposite variation; this is attributed to the grain size and dipole dynamics. Complex impedance (Z^*) and electric modulus (M^*) planes show three overlapping regions as the response for the bulk, the grain boundaries and the film/electrode interface mechanisms. These mechanisms have been represented by an equivalent circuit. The imaginary component of electric modulus (M'') versus frequency plots, which reveal relaxation peaks that are not observed in the dielectric loss (ϵ'') plots, and it is found that these peaks are of a non-Debye-type. Furthermore, the frequency dependent conductivity plot shows three regions of conduction processes.