Dielectric Relaxation Observed in La Doped Strontium Titanate

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ABSTRACT

SrTiO3 (STO) is one of the promising high-k materials to replace SiO2 being the insulator layers in the semiconducting nanodevices. Further more, the dielectric constant is even higher after introducing lanthanum dopant. This research will discuss the temperature (300 K～77 K) dependence of complex dielectric permittivity for Sr1?xLaxTiO3 (x = 0.01～0.07) ceramics at a series of fixed frequencies (100～10 MHz). The temperature of dielectric loss peaks risen with increasing field frequency with obey the Debye Model, and relaxation times can be described by the Arrhenius Law. The activation energies deduced from the Arrhenius law vary from 0.23 to 0.3 eV. In general, the activation energy increases with increasing concentrations of the La ion. The Cole-Cole plot of Sr0.98La0.02TiO3 and Sr0.97La0.03TiO3 fit well into a circular arc which represents the materials having a symmetrical distribution of relaxation times. Fitting the experimental data to Cole-Cole equation show that the angle of the circular arc α is from 0.26 to 0.39.

Keywords : dielectric relaxation ; Sr1?xLaxTiO3 ; activation energy ; Cole-Cole plot

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