**Abstract**

To study the effect of Ce in the NBT-BT lattice, 0.4 wt% of CeO2 was added to the 0.94(Na0.5Bi0.5TiO3)-0.06BaTiO3, in its morphotropic phase boundary (MPB) composition, and the single crystals were grown by the flux method using Bi2O3 as a flux. The structural studies were carried by the XRD and Raman analyses. The dielectric constants were measured from room temperature to 400 °C for various frequencies in the range of 20 Hz-2 MHz. The anti-ferroelectric temperature region is increasing due to the addition of Ce in the NBT-BT. The maximum value of dielectric loss is also found to decrease from 0.4% to 0.1% due to the Ce addition. The conductivity and impedance analyses were carried out to study the relaxation process of Ce-NBT-BT single crystals.