**Abstract**

NBT-BT (sodium bismuth titanate-barium titanate) lead-free ceramics were prepared via the conventional solid-state reaction method in the Morphotropic Phase Boundary (MPB) composition. The prepared ceramics were irradiated with 100 MeV O7+ ions using four different fluences of 5 × 1011, 1 × 1012, 5 × 1012 and 1 × 1013 ions/cm2. The dielectric constants of the pristine and irradiated samples were determined from 300 to 623 K for a broad range of frequencies from 20 Hz to 2 MHz. Irradiation with oxygen ions decreased the anti-ferroelectric temperature region present in the samples. The structural stability of the samples against the irradiation was investigated via XRD and Raman spectroscopy before and after the irradiation.