**Abstract**

Using the conventional solid-state reaction method, 0.5wt.% of MnO2-, NiO-, Cr2O3-, Fe2O3- and Co2O3-added 0.94Na0.5Na0.5Bi0.5Bi0.5TiO3 (NBT)–0.06BaTiO3 (BT) ceramics were prepared. The perovskite nature of the prepared ceramics was analyzed by powder XRD and the surface morphology was studied by means of SEM. The dielectric analysis was carried out from room temperature to 350∘350∘C at various frequencies and the diffusive transition at the dielectric maxima confirmed the relaxor nature of the ceramics. Creation of oxygen vacancies by the possible substitution of ferromagnetic impurities decreased the dielectric constant and piezoelectric constant (d33)d33). The co-existence of ferromagnetism and the ferroelectricity was observed in the Mn, Ni, Co and Cr-added NBT–BT ceramics. The magnetic force microscopy (MFM) analysis was carried out to study the ferromagnetic domains in the prepared ceramic.