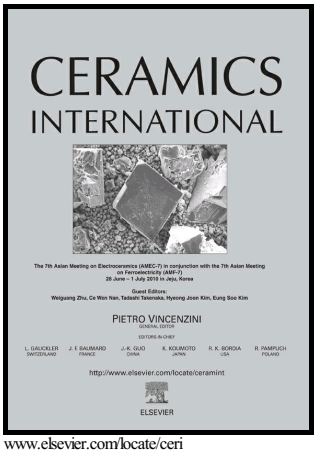

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Effect of CuO addition on magnetic and electrical properties of $Sr_2Bi_4Ti_5O_{18}$ lead-free ferroelectric ceramics

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Abstract

The effect of CuO addition on magnetic and electrical properties of $Sr_2Bi_4Ti_5O_{18}$ (SBT) lead-free bismuth layered structure ferroelectric ceramics have been studied and reported. Interestingly, the prepared samples exhibit multiferroic behavior with the coexistence of magnetic and ferroelectric phase transition temperature. Magnetic phase transition with Neel's temperature (T_N) of 657 K is observed at 0.75 mol %, which is higher than the well known multiferroic $BiFeO_3$ (643 K) and the ferroelectric phase transition with Curie temperature (T_C) of 587 K is observed at 1 mol %, which is relatively higher than the reported pure SBT ceramics (558 K). Further, the electrical properties such as dielectric, ferroelectric, piezoelectric, leakage current density characteristics and optical properties were investigated as a function of x (x = 0, 0.25, 0.5, 0.75 and 1 mol %). Presence of strong magnetic super-exchange interactions in CuO and the creation of oxygen vacancies play a vital role in the enhancement of magnetic and electrical properties of CuO doped SBT ceramics. Moreover, the present results indicate that, small amount (0.25 mol %) of CuO addition in SBT ceramics enhances the electrical properties significantly and vice versa, large amount (0.75 mol %) of CuO addition enhances the magnetic properties. Thus, the presence of magneto-electric coupling effect was observed in CuO doped $Sr_2Bi_4Ti_5O_{18}$ ferroelectric ceramics.