Phase formation and dielectric properties of pentavalent cation doped non-stoichiometric Bismuth Zinc Niobate (BZN) cubic pyrochlore.

Abstract

In an attempt to synthesize new solid solutions and search for better performance materials, pentavalent cation dopants were introduced into the non stoichiometric BZN cubic pyrochlore, Bi3Zn1.84Nb3O13.84. Extensive solid solutions were formed in Bi3Zn1.84Nb3-xDxO13.84 with limit at x = 3 and 2.6 for D = Ta and Sb, respectively. This illustrates the possibility of cation exchange solid solutions due to similarity in dopants’ ionic radii. The elemental analysis confirmed the stoichiometry of doped materials with no deleterious Bi2O3 loss. Ta / Sb doped samples were highly resistive with activation energies ranging from 1.2 - 1.9 eV. Temperature coefficient of capacitance, TCC, decreased from -396 ppm / oC to ~ -180 ppm / oC and ~ -90 ppm / oC for both end members, respectively.

Keyword: Pyrochlore; Solid solutions; Electroceramics; Chemical doping.