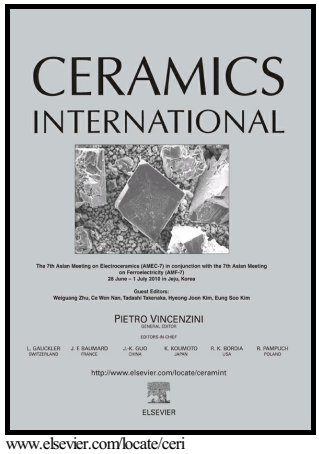


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# Role of Nd-Ni on structural, spectral and dielectric properties of strontium-barium based nano-sized X-type ferrites

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## Abstract

The influence of neodymium and nickel substitution on structural and dielectric parameters was investigated in strontium-barium X-type hexagonal ferrites having composition $SrBaCu_{2-x}Ni_xNd_yFe_{28-y}O_{46}$ (x=0, 0.2, 0.4, 0.6, 0.8, 1 and y=0, 0.02, 0.04, 0.06, 0.08, 0.1). Sol-gel method was employed for synthesizing these hexagonal ferrites. The XRD plots of all studied materials which were annealed at 1250 $^oC$ show single phase characteristics. Lattice parameter 'c' increased as a consequence of larger radius of rare earth ion ($Nd^{3+}$) as compared to ($Fe^{3+}$), while lattice parameter 'a' showed very small variation. The cell volume was obtained in the range 2508.32-2523.75 ($Å^3$). The inclusion of Nd-Ni also affected X-ray density, bulk density and porosity. The FTIR spectroscopy indicated the particular absorption peaks of hexagonal ferrites and it was performed in the range of 500-700 $cm^{-1}$. On account of Nd-Ni doping, the dielectric constant, dielectric loss and AC-conductivity showed decreasing trend. The occupancy of $Nd^{3+}$ ions at octahedral site impedes the valence alternation of $Fe^{3+}$; therefore there was decrease in dielectric permittivity. Ac conductivity has been decreased from 9.14 to 6.49 $(\Omega cm)^{-1}$ at frequency of 2.7 GHz. The Cole-Cole plots of synthesized materials noticeably revealed grain boundary contribution. The appearance of single semi-circle in impedance Cole-Cole graphs confirms the exceptional role of grain boundaries in the conduction process. The considerably