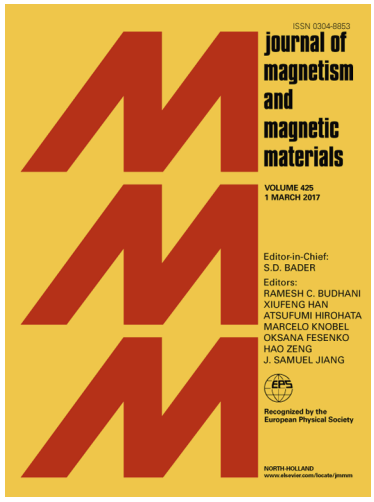

Research articles

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Magnetic interactions and electrical properties of Tb^{3+} substituted NiCuZn ferrites

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Abstract

We report the electric and magnetic properties of nanocrystalline Tb^{3+} substituted $Ni_{0.25}Cu_{0.30}Zn_{0.45}Tb_xFe_{2-x}O_4$, with x= 0.0-0.125 mol., step: 0.025 mol ferrites, synthesized by glycine assisted autocombustion route. The structural studies confirm the formation of spinel cubic structure for NiCuZn ferrites with the formation of agglomerated polydisperse grains. The presence of two intrinsic IR absorption bands of spinel lattice at ν_1 (760-768) cm^{-1} and ν_2 (650-665) cm^{-1} for NiCuZn ferrite system confirms the existence of tetrahedral-A and octahedral-B sites over which the cations are distributed in spinel lattice. Complex permeability measurements signified the decrease in the initial permeability due to spin canting and spin frustration by paramagnetic Tb^{3+} ions. The frequency dependent dielectric constant of NiCuZn ferrites revealed the dielectric dispersion behavior in accordance with Maxwell–Wagner model. The incorporation rare earth element (Tb^{3+}) in NiCuZn ferrite at relatively lower sintering temperature (1173 K), significantly alters the structural and electromagnetic properties of the host material. Therefore, the present Tb^{3+} substituted NiCuZn ferrite system with moderate electrical resistivity and soft magnetic properties are potential candidate for multilayer chip inductor (MLCI) component applications.