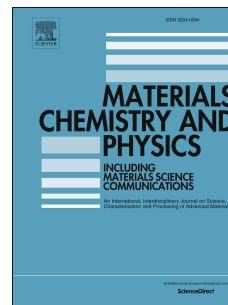


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S. Prathap, W. Madhuri, Sher Singh Meena



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Effect of non-stoichiometry in Lead hexaferrites on magnetic and dielectric properties

S. Prathap¹, W. Madhuri^{1,*} and Sher Singh Meena^{2,*}

¹Ceramic Composite Laboratory, Centre for Crystal Growth, SAS, VIT, Vellore-632014, Tamilnadu, India

²Solid State Physics Division, Bhabha Atomic Research Centre, Mumbai 400 085, India

Abstract

The effect of iron deficiency on the structural, electrical and magnetic properties of the nano $\text{PbFe}_{12-x}\text{O}_{19-\delta}$ (where $x = 0.0, 0.25, 0.50, 0.75$ and 1.0) hexaferrites prepared by sol-gel auto combustion and further processed by microwaves is presented. The structure studied using transmission electron microscope (TEM) showed hexagonal cylindrical particles with an average size of ~ 20 nm. Selected area electron diffraction (SAED) reflected highly crystalline nature of these nanoparticles. From the dielectric characterizations ac-conductivity, dielectric constant and loss tangent are analysed for pure and modified $\text{PbFe}_{12-x}\text{O}_{19-\delta}$ hexaferrites. The magnetic analysis revealed the formation of single-domain structure. Saturation magnetisation (M_S) decreases from 63.2 ($x = 0$) to 38.2 ($x = 1.0$) emu/g with increasing the Fe ions deficiency. Room temperature Mössbauer spectra show five sextets for all compositions confirmed the single phase formation. The relative area of $12k$ (\uparrow) site decreases and $4f_2$ (\downarrow) increases drastically with increasing the Fe ions deficiency in Pb-hexaferrites.

Keywords: Hexaferrites; Magnetic properties; Microwave sintering; Sol-Gel method; Mössbauer spectra.

*Corresponding authors

Email: madhuriw12@gmail.com (Madhuri W)

ssingh@barc.gov.in (S.S. Meena)

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