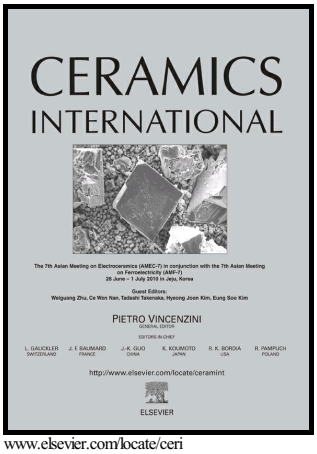

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The role of Pb and annealing temperature on the structural, magnetic, optical and dielectric properties of W-type hexaferrite nanostructures

Seyed Ebrahim Mousavi Ghahfarokhi[a] *Nazanin Alirezaei Varnosfaderani[b] and Morteza Zargar Shoushtari[c]

[a] *Associated Professor, Department of Physics, Faculty of Science, Shahid Chamran University of Ahvaz, Ahvaz, Iran.*

[b] *PhD Student, Department of Physics, Faculty of Science, Shahid Chamran University of Ahvaz, Ahvaz, Iran.*

[c] *Professor, Department of Physics, Faculty of Science, Shahid Chamran University of Ahvaz, Ahvaz, Iran.*

musavi_ebrahim@yahoo.co.uk

n.alirezaei@gmail.com

zargar@scu.ac.ir

Abstract

In this paper, W-type $Sr_{1-x}Pb_xCo_2Fe_{16}O_{27}$ nanostructures were synthesized by auto-combustion sol-gel method. Then, the effects of annealing temperature and Pb contents on the structural, magnetic, optical, and dielectric properties of $Sr_{1-x}Pb_xCo_2Fe_{16}O_{27}$ nanostructure were investigated. First, a gel of metal nitrates with a specific molar ratio with x different was prepared and then the gel was annealed at different temperatures for 4 h. To determine the annealing temperature of the samples, the prepared gel was examined by thermogravimetric analysis and differential thermal analysis. The morphology and crystal structure of the prepared samples were characterized by field emission scanning electron microscopy (FESEM) and X-ray diffraction pattern (XRD). The results of XRD patterns indicated that the annealing temperature of synthesized $Sr_{1-x}Pb_xCo_2Fe_{16}O_{27}$ was reduced by increasing Pb contents. In addition, FESEM images showed that the microstructure of the samples was homogeneous and uniform, but since the samples have a magnetic property, the particles were aggregated. Fourier transform infrared analysis (FT-IR) was used to confirm the phase formation. The FT-IR results of the samples indicated that the tetrahedral and octahedral sites, which are the important attributes of hexaferrites, were formed. The magnetic properties of the samples were measured by vibrating sample magnetometer (VSM). The VSM results of the samples showed that because of increasing Pb content, the amount of saturation magnetization and that of magnetic coercivity decreased from 81.29 to 10.23emu/g and 2285 to 477 Oe, respectively. The optical properties of the samples were investigated by ultraviolet–visible spectroscop**y**, which revealed that the energy gap