

Synthesis, optical and magnetic behavior of $(\text{BiFeO}_3)_{1-x}(\alpha\text{-Fe}_2\text{O}_3)_x$ nanocomposites

ABSTRACT

$(\text{BiFeO}_3)_{1-x}(\alpha\text{-Fe}_2\text{O}_3)_x$ nanocomposites were synthesized from dried gels of BiFeO_3 and $\alpha\text{-Fe}_2\text{O}_3$. Samples with $x = (0.00 (\text{BiFeO}_3), 0.25, 0.50 \text{ and } 1.00 (\alpha\text{-Fe}_2\text{O}_3))$ were studied using X-rays diffractions (XRD), UV-vis spectroscopy, photoluminescence spectroscopy (PL), electron spin resonance (ESR) and vibrating sample magnetometer (VSM). Amounts of $\alpha\text{-Fe}_2\text{O}_3$ phase were 23 and 35% for samples $x = 0.25$ and 0.50 , respectively. Microstrain of BiFeO_3 phase tended to decrease with increasing $\alpha\text{-Fe}_2\text{O}_3$. Optical band gap reduced from 2.42 eV for BiFeO_3 to 2.35 eV for sample $x = 0.25$ and then increased to 2.56 eV for sample $x = 0.50$. From PL, intensity of near band emission peak of BiFeO_3 increased with increasing $\alpha\text{-Fe}_2\text{O}_3$ content. From ESR and VSM, the g -value and magnetization saturation were enhanced with embedding of $\alpha\text{-Fe}_2\text{O}_3$ into BiFeO_3 .

Keyword: BiFeO_3 ; $\alpha\text{-Fe}_2\text{O}_3$; Nanocomposite; Microstrain; Band gap; Magnetization