

The influence of annealing temperature on structural and optical properties of bismuth ferrite (BiFeO₃)

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Abstract

In this article, bismuth ferrite nanoparticles (BiFeO₃) were prepared by the sol-gel method. Thermogravimetric analysis (TGA) and differential thermal analysis (DTA) were performed on dry gel to determine the annealing temperature range of bismuth ferrite nanoparticles. The samples were annealed at 600, 650, 700, 750, 800, and 850 °C using the results of TGA and DTA. Then, the structural and optical properties of the samples have been investigated by X-ray diffraction (XRD), Fourier transform-infrared spectroscopy (FT-IR), field emission scanning electron microscopy (FESEM), ultraviolet-visible spectroscopy analysis (UV-Vis), and photoluminescence analysis (PL). The results of XRD and FT-IR analysis showed that samples have distorted perovskite structure. The FESEM analysis results indicated that by increasing the annealing temperature, the size of nanoparticles increases. Furthermore, UV-Vis and PL analysis showed that samples have an energy gap of about 2 eV and are semiconductor.

Keywords: BiFeO₃, nanoparticles, sol-gel method, thermal analysis, structural properties, optical properties

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