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Structural and Photocatalytic Analysis of Mn and Gd in BFO

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Abstract

Bismuth ferrite ($BiFeO_3$) has attracted significant attention due to its wide range of potential applications. In the present work, rare-earth (Gd) and transition-metal (Mn) are codoped in bismuth ferrite. $Bi_{1-x}Gd_xFe_{1-y}Mn_yO_3$ samples with doping concentrations ($x, y = 0$, 0.05, 0.10, 0.15, and 0.20) were synthesized using a modified sol–gel auto-combustion method. The samples were finely ground using an agate mortar and pestle and subsequently annealed at 550°C for 2 h in air using a muffle furnace.

XRD analysis indicates the formation of a rhombohedral crystal structure with space group R3c. The morphological characteristics of the samples were examined using (FESEM). The photocatalytic performance of pure and co-doped BFO samples was evaluated using a solar lamp simulator. The results demonstrate enhanced photocatalytic activity for Mn and Gd co-doped BFO compared to pure BFO, attributed to improved charge separation and modified electronic structure induced by co-doping.

Keywords: Bismuth ferrite, Sol–gel auto-combustion method, XRD,FESEM, Photocatalysis, Solar lamp simulator

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