Synthesis and Characterization of Dysprosium-Doped Zn Ferrite Nanoparticles via Sol–Gel Auto Combustion Method

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Abstract

In this study, Dysprosium-doped Zn ferrite nanoparticles were synthesized using a simple sol–gel auto combustion technique with citric acid as a fuel. The synthesis involved preparing nitrate solutions of cobalt, zinc, iron, and dysprosium, adjusting the pH to 7, and heating to obtain a gel which was then calcined at 500°C for 5 hours. Characterization techniques, including XRD, FTIR, SEM, EDS, TEM, and TGA-DTA, confirmed the formation of nanoscale spinel-phase ferrites with high purity. The average particle size was found to be approximately 12.72 to 19.27 nm, and structural parameters such as lattice constants decreased with increasing Dy content. Morphological analysis revealed irregular structures, and EDAX confirmed the presence of constituent elements without impurities.

Keywords

Ensemble clustering, Deep learning, Marine Predator Algorithm, Spectral data, Weight optimization, High-dimensional data.