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Hydrothermally synthesized BiFeO₃ nanoparticles and its photocatalytic activity

The studies of advanced materials in environmental remediation and degradation of pollutants is rapidly advancing because of their wide varieties of applications. BiFeO₃ (BFO), a perovskite nanomaterial with a rhombohedral R3c space group, is currently receiving tremendous attention in photodegradation of dyes. The photocatalytic activity of BFO nanoparticle is a promising field of research in photocatalysis. BFO nanomaterial is a photocatalyst enhanced by doping because of its reduced bandgap energy (2.0–2.77 eV), multiferroic property, strong photoabsorption and crystal structure. The material has proven to be very useful for the degradation of dyes under visible light irradiation among other photocatalysts. Its exceptional nontoxicity, suitability, low cost and long term excellent stability makes it an efficient photocatalyst for the degradation of effluents from textile and pharmaceutical industries which ended up in the environment and now a major concern of the modern world.

Multiferroic BiFeO₃ (BFO) nanoparticles (Nps) were synthesized using hydrothermal method. From the X-Ray diffraction analysis (XRD), the synthesized Nps were found to have a rhombohedral structure with R3c space group confirmed by Rietveld analysis. Fourier transform infrared spectroscopy (FTIR) analysis was carried out to identify the chemical bonds present in the BFO Nps. Photocatalytic properties of synthesized Nps were studied for the degradation of Methylene Blue (MB) dye under visible light of 150W.

Keywords: BiFeO₃, multiferroic, photocatalyst, hydrothermal method;