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Synthesis of NiO nanoparticles by the Pechini sol-gel method

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Abstract:

Nickel oxide (NiO) nanoparticles have attracted considerable attention due to their remarkable photocatalytic properties, particularly in the field of environmental remediation and water purification. These nanoparticles can catalyse oxidation reactions to degrade pollutants and exhibit antibacterial properties, thus contributing to water disinfection. This study focuses on the synthesis of NiO nanoparticles using the Pechini method, a versatile technique developed and patented by Mario P. Pechini in 1967. Nickel acetate was used as a precursor, followed by a thermal treatment at 450°C for 2 hours. The structural properties of the particles were characterised by X-ray diffraction (XRD). The photocatalytic activity of the NiO nanoparticles was evaluated by assessing the degradation of methylene blue under UV irradiation. The XRD results showed that the nanoparticles synthesised by the Pechini method exhibited superior homogeneity and crystallinity. The increased crystallite size contributed to the photocatalytic efficiency of the NiO nanoparticles, as it can minimise carrier recombination and increase the active surface area for photocatalytic reactions. The Pechini method stands out as a valuable approach for the synthesis of advanced materials, offering exceptional homogeneity, reduced processing temperatures and the ability to produce nanomaterial while maintaining economic viability.

Key words: NiO nanoparticles, Pechini method, photocatalysis

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