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NANOSCALE ZERO VALENT IRON PARTICLES (nZVI): AN EFFECTIVE SOLUTION FOR METHYL ORANGE AZO DYE REMOVAL

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Abstract

Nanoscale Zero Valent Iron (nZVI) particles were used to remove color from a water-soluble azo dye, methyl orange, using batch and column experiments. The particles rapidly reduced the color, reaching equilibrium within 20 minutes. Complete color removal was achieved using 0.6 g L⁻¹ of nZVI when the initial concentration of methyl orange was 100 mg L⁻¹, and the pH was 3. The maximum decolorization ratio of 97% was achieved within 10 minutes, with the pH playing a significant role. Gas Chromatography-Mass Spectrometry (GC-MS) was used to analyze the decolorization products, revealing that 98% of the MO was converted to N, N-dimethyl-p-phenylenediamine by the nZVI particles. Additionally, the equilibrium relationship between the sorbent and sorbate was determined. Besides, Kinetic studies provided insights into the adsorption rate and its mechanisms.

Key words: adsorption, decolorization, methyl orange, kinetics, Nanoscale Zero Valent Iron (nZVI)

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