Oxidative degradation of Methyl Orange catalyzed by lab prepared nickel hydroxide in aqueous medium

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\textbf{ABSTRACT}

This study is focused on oxidative degradation of Methyl Orange, a common azo dye, catalyzed by nickel hydroxide in aqueous solution at 303, 313, 323, and 333 K. Sodium hypochlorite, sodium hydroxide, and nickel sulfate hexahydrate in distilled water were used as starting material for preparation of nickel hydroxide. Pyrex glass batch reactor was used to study the effect of various conditions such as temperature, concentration, agitation, and catalyst dose on catalytic degradation of Methyl Orange in aqueous medium. About 80\% Methyl Orange was degraded in 120 min. Experimental data were subjected to kinetic analysis using CurveExpert software. Degradation reaction was taking place according to Langmuir–Hinshelwood mechanism. According to this mechanism, the reactants adsorb at the surface of catalyst in first step followed by reaction between adsorbed reactants in second step. Adsorption of Methyl Orange on surface of catalyst followed Langmuir adsorption isotherm. Apparent activation energy, true activation energy, and heat of adsorption were determined as 13.2, 32.7 and \(-23.5\) kJ mol\(^{-1}\), respectively.

\textbf{Keywords:} Methyl Orange; Nickel hydroxide; Kinetic analysis; Langmuir–Hinshelwood mechanism; Langmuir adsorption isotherm; Activation energy