Synthesis, characterization and photocatalytic activity of CaZrO\textsubscript{3} - SiO\textsubscript{2} nanocomposite for the decolorization of indigo carmine dye

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\textbf{A B S T R A C T}

The photocatalytic decolorization of indigo carmine (acid blue 74) in an oxidation process was studied using a silica-calcium zirconate (CZS) powder as a semiconductor photocatalyst in a batch reactor equipped with a 15W low-pressure mercury lamp. The effects of various influential parameters including initial dye concentration, photocatalyst dose, pH, temperature and stirring rate on the dye decolorization were also optimized. The optimum value of initial dye concentration, photocatalyst concentration and stirring rate were 5 ppm, 0.04 g/L, and 600 rpm, respectively. Furthermore, the maximum decolorization was observed at the pH of 3. X-ray diffraction (XRD) and infrared spectra (FT-IR) techniques were used to confirm the formation of photocatalyst. The particle size and specific surface area of photocatalyst were determined by scanning electron microscopy (SEM) and Brunauer-Emmett-Teller (BET) theory. UV-Vis spectroscopy was employed to evaluate the dye degradation and LC-MS technique was used to evaluate the formation of the intermediate compounds. The results indicate that silica-calcium zirconate nanocomposite is suitable for the degradation of organic pollutants from wastewater.

\textit{Keywords:} Photocatalysis; Decolorization; Acid Blue 74; Calcium zirconate; Textile industry wastewater