SYNTHESIS AND CHARACTERIZATION OF FLY ASH/TIO2 PHOTOCATALYTIC NANOCOMPOSITES

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Abstract

Water pollution problems have been an important issue correlated negatively with the health and the environment. One of the most important materials, used in water purification processes like photocatalysis, is titanium dioxide (TiO2), which is widely used due to its high photocatalytic activity, nontoxicity and low price. Fly ash, a waste material produced in large quantities in coal burning power plants or steel mills, can be used as an effective catalyst carrier and enables easier separation of a catalyst after process.

This study involves preparation of fly ash/TiO2 photocatalytic nanocomposites for photocatalytic treatment of a wastewater contaminated with azo dye Reactive Red 45 (RR45). Nanocomposites were obtained by preparation route which primarily included fly ash modification by hydrochloric acid (HCl) in order to get higher specific surface of fly ash. Then followed the synthesis of TiO2 from tetrabutyl titanate in a presence of fly ash, which resulted in a preparation of fly ash/TiO2 nanocomposites. The content of fly ash in the nanocomposite samples was from 16 to 20 %. Some samples were prepared with addition of small amount of commercial TiO2 P25 Degussa (1-3 %).

Prepared fly ash/TiO2 nanocomposites were characterized by X-ray diffraction (XRD) and scanning electron microscopy (SEM). The photocatalytic efficiency of prepared samples was studied as a decomposition of RR 45 dye, which was monitored by UV-VIS spectroscopy as a change in absorbance of characteristic wavelength at 542 nm.

Results show good photocatalytic efficiency of all fly ash/TiO2 nanocomposite samples, especially for the sample FA4/20-TiB-1.

Keywords: Water purification, photocatalysis, titanium dioxide, nanocomposites, Reactive Red 45

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