A comparative study of the photocatalytic efficiency of Degussa P25, Qualigens, and Hombikat UV-100 in the degradation kinetic of congo red dye

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\textbf{ABSTRACT}

The photocatalytic efficiency of three TiO\textsubscript{2} photocatalysts; Degussa P25, Qualigens, and Hombikat UV 100 has been investigated on the degradation kinetic of congo red dye. The crystal phases, structures, and crystallite sizes of the catalysts were analyzed by X-ray diffraction, microstructure, and morphology by transmission electron microscopy, and surface area and pore-size distributions by nitrogen physisorption. The results of the kinetic study revealed that the activities of the photocatalysts were dependent on their particle sizes, and the best activity was obtained with Hombikat UV-100, which was of the smallest particle size, was mesoporous, and had the largest surface area. The activation energy required for the degradation of the congo red dye was found to increase proportionately with the particle size of the catalysts. The effects of various operational parameters such as catalysts dosages, initial dye concentration, and temperature were systematically studied in order to achieve maximum degradation efficiency. The results of the investigations suggest that Hombikat, another model photocatalyst, can be used more effectively in the place of Degussa P25 in photocatalytic degradation of congo red dye.

\textbf{Keywords:} Congo red dye; Photocatalysts; Photocatalysis; Adsorption; Dye removal; Dye degradation

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