

A Comparative Study of Different Methods to Prepare TiO₂ for Sonophotocatalytic Degradation of 2,4-dichlorophenoxyacetic Acid

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The photocatalytic degradation of 2,4-dichlorophenoxyacetic acid (2,4-D) under UV light irradiation and combined with ultrasound (sonophotocatalysis) were carried out in a glass reactor. Different synthetic methods were used to prepare titanium oxide powder as the photocatalysts. The chemical and physical properties of the photocatalyst samples were determined by X-ray diffraction (XRD), Scanning electron microscopy (SEM) and UV - vis diffuse reflectance spectra (UV-vis), also the specific surface area of all samples was measured by Brunauer-Emmett-Teller sorptometer (BET).

The activity performance of prepared TiO₂ photocatalysts under photocatalytic and sonophotocatalytic degradation was evaluated by UV-vis spectrophotometer to determine the concentration of 2,4-dichlorophenoxyacetic acid (2,4-D). The rates of photocatalytic and sonophotocatalytic degradations are affected by the initial pH value, probe size, power intensity, photocatalyst loading, salts addition, and gas supplying.

The kinetic laws for the photocatalytic and sonophotocatalytic degradation are determined to apparently the pseudo first-order with respect to the concentration of 2,4-D. The synergistic effect of sonophotocatalytic degradation of 2,4-D is compared with photocatalytic reaction.

Keywords: probe-type ultrasound, sonophotocatalysis, TiO₂, 2,4-dichlorophenoxyacetic acid.

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