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Photocatalytic activity of sol–gel-derived mesoporous TiO_2 thin films for reactive orange 16 degradation

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ABSTRACT

This study investigates the photocatalytic activity of sol–gel-derived mesoporous TiO_2 thin films for reactive orange 16(RO16) degradation. Both surfactant- and non-surfactant-assisted sols were prepared and coated on different glass slides. The prepared catalysts were characterized by X-ray diffraction, surface scanning electron microscopy, UV–vis transmittance spectra, and nitrogen adsorption/desorption isotherms for their properties, while the photocatalytic activities of the TiO_2 thin films were evaluated in the degradation of RO16. The surfactant-assisted films showed surface uniformity, reduced particle size, and high photocatalytic activity compared to non-surfactant assisted films. The effects of withdrawal speed on films' transparency and the number of coatings on UV light absorption and their photocatalytic activities are systematically explained for the surfactant-assisted films. Though there was a continuous increase in the efficiency of the mass of TiO_2 per unit area and UV light absorption with the increase in the number of dip-coatings, any further increase in the number of coatings beyond five did not show any significant increase in the degradation rate, indicating that further coatings resulted in the blocking of middle pores.

Keywords: Sol–gel; Mesoporous TiO_2; Thin film; UV light absorption; Degradation; Dye

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