

Rachan Leotphayakkarat 2011: Synthesis and Characterization of Nanocrystalline TiO₂ Thin Films by Sol-gel Method for Photodegradation of Reactive Yellow 17. Master of Science (Chemistry), Major Field: Chemistry, Department of Chemistry. Thesis Advisor: Associate Professor Sudjit Sanguanruang, Ph.D. 96 pages.

In this work, the porous thin films titanium dioxide photocatalyst were successfully prepared by an adapted sol-gel method using titanium tetraisopropoxide (TTIP) as a precursor with the addition of EtOH, AcOH, conc.HCl and the surfactants in the mol ratios of 1: 45: 6: 0.1: R, respectively. In this study three surfactants, TritonX-100, Tween 80 and Brij 35 were added into the gel with various amounts (R) of 0, 0.25, 0.5, 1.0, 2.0, 3.0 and 4.0 mol ratios. The prepared gels were deposited onto borosilicate glass substrates by dip-coating technique and then calcined at 500 °C for 15 minutes to obtain the films. The results from thin film characterizations by XRD, UV-Vis spectroscopy, SEM and AFM exhibited that all of prepared films were anatase phases of titanium dioxide with the particle sizes of 25-32 nm and the adsorption edges around 380 nm. The gels with surfactants adding gave the thin films with high porosity and loose particles aggregation denoting to the high surface area of prepared films while the without adding gave more dense and low roughness.

The results from photocatalytic degradations of reactive yellow 17 by the prepared films under the UV light showed that the degradation reaction obeyed the first order kinetics. The prepared thin films from the small amount of the surfactant exhibited higher catalytic activity than that of without the surfactant adding, but the activity was reduced when the amounts of the surfactants increased. The films from 0.25 mol ratios of tween 80/TTIP showed the highest photodegradation for the reactive yellow 17 within 120 minutes, 84.49%.

Student's signature

Thesis Advisor's signature