

Characterization of SnO₂/TiO₂ with the addition of Polyethylene Glycol Via Sol-Gel Method for Self-Cleaning Application

Abstract

TiO₂ is one of the most widely used metal oxide semiconductors in the field of photocatalysis for the self-cleaning purpose to withdraw pollutants. Polyethylene glycol (PEG) is recommended as a stabilizer and booster during preparation of water-soluble TiO₂. Preparation of SnO₂/TiO₂ thin film deposition on the surface of ceramic tile was carried out by the sol-gel spin coating method by adding different amount of PEG (0g, 0.2g, 0.4g, 0.6g, 0.8g) during the preparation of the sol precursor. The effects of PEG content and the annealing temperature on the phase composition, crystallite size and the hydrophilic properties of SnO₂/TiO₂ films were studied. The X-ray diffraction (XRD) spectra revealed different phases existed when the films were annealed at different annealing temperatures of 350°C, 550°C and 750°C with 0.4 g of PEG addition. The crystallite sizes of the films were measured using Scherrer equation. It shows crystallite size was dependent on crystal structure existed in the films. The films with mixed phases of brookite and rutile shows the smallest crystallite size. In order to measure the hydrophilicity properties of films, the water contact angles for each film with different content of PEG were measured. It can be observed that the water contact angle decreased with the increasing of the content of PEG. It shows the superhydrophilicity properties for the films with the 0.8 g of PEG annealed at 750°C. This demonstrates that the annealed temperature and the addition of PEG affect the phase composition and the hydrophilicity properties of the films.

Keywords

Polyethylene Glycol; Self-Cleaning; SnO₂; Thin Film; TiO₂