GAS-PHASE PHOTOCATALYTIC ACTIVITY OF TiO_2 THIN FILMS BY CHEMICAL SPRAY PYROLYSIS

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In this study, we showed that the TiO_2 thin films practicable for air purification and self-cleaning applications. TiO_2 thin films were deposited onto borosilicate glass substrates at 350 to 450 °C and annealed at 500 °C for 1 h in air. The morphology, chemical composition and structural properties of TiO_2 thin films were characterized by Raman, XRD, XPS and AFM methods. The photocatalytic activity of the films was tested for the degradation of VOCs in multi-section plug-flow reactor. The process operating parameters, like relative humidity (RH), residence time (RT), initial concentration (IC) of pollutants and irradiation source were varied. According to SEM and AFM, the TiO_2 films grown at 350 and 450 °C are smooth and well-adhered with thickness of ca. 190 and 330 nm, respectively. The mean crystallite size was observed a decrease with the increase of deposition temperature of TiO_2 films from 350 to 450 °C are 40 and 26 nm. TiO_2 film deposited at 450 °C shows interference fringes with a total transmittance ~80% while the film deposited at 350 °C is ~90% in visible region. The wettability test results showed that the TiO_2 thin films are superhydrophilic after 30 min UV light treatment. The TiO_2 film deposited at 350 °C exhibited the highest amount of conversion of methyl tert-butyl ether (MTBE) and acetone, 100% under UV-light. The TiO_2 film deposited at 350 °C showed 60% conversion of MTBE under visible light. It has been observed that the increasing the RH and IC inhibited the photodegradation of MTBE.

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