TITANIA THIN FILMS BY CHEMICAL SPRAY PYROLYSIS AS PHOTOCATALYTIC MATERIALS FOR AIR PURIFICATION

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TiO_2 nanopowders are generally used in photocatalysis because of their higher activity if compared to thin films. However, coatings that are prepared from nanopowders are less mechanically stable, i.e. have weaker than thin films adhesion to the substrates. This study is focused on the preparation of TiO_2 thin films by chemical spray pyrolysis for gas-phase environmental applications. TiO_2 thin films were deposited by spray pyrolysis method onto soda lime glass substrates from the solution containing titanium(IV)isopropoxide [TTIP] (0.0002-0.2 mol/L) and acetylacetone in molar ratio of 1:4 in ethanol. The films were deposited as single and double layer configurations at temperatures ranging from 250 to 450^oC and subsequently annealed at 500 ^oC for 1h. The morphology, chemical composition and structural properties of TiO_2 thin films were characterized by Raman, XRD, XPS and AFM methods. Surface wettability of the TiO_2 films deposited at various temperatures was tested by measuring the water contact angle (CA). The films' photocatalytic activity for the degradation of VOCs was studied in multi-section plug-flow reactor. The process operating parameters, like air humidity, residence time, content of pollutants and irradiation source were varied.

The results show that well-adhered anatase TiO_2 films with mean crystallite size in the range of 20 to 30 nm can be deposited by spray pyrolysis method; the use of TiO_2 double layer configuration hinders the Na^+ diffusion and increases the mean crystallite size up to off ca 40 nm. The TiO_2 thin films shows superhydrophilic behavior. The photocatalytic activity of TiO_2 films in gas-phase will be discussed.

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