Fabrication of Double-Walled Titania Nanotubes and Their Photocatalytic Activity

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Synopsis

Double-walled titanium dioxide nanotubes have shown enhanced photocatalytic acitivty, which could be used for water or air purification in the environment.

Abstract

Abstract Image

Double-walled titanium dioxide (TiO2) nanotubes have been successfully fabricated by electrochemical anodization at low temperature with subsequent annealing. The low temperature allows for suppression of the chemical etching. The as-fabricated and annealed TiO2 nanotubes are typically single-walled for tubes with diameters less than 150 nm. For nanotubes with diameters greater than 150 nm, it was observed that annealing initiated tube splitting of one to two and hence resulted in double-walled nanotubes. Raman spectroscopy analysis showed anatase phase for the nanotubes. Compared to the single-walled TiO2 nanotube, double-walled nanotubes have enlarged surface areas. This makes TiO2 nanotubes with a double-walled structure more effective for catalytic applications. Photocatalytic testing under ultraviolet (UV) radiation proved enhanced photocatalytic activity with a faster degradation rate of the organic chemical with double-walled nanotube film compared to the single-walled sample.

Keywords: Titanium dioxide; Double-walled nanotube; Photocatalytic; Water purification