

Fabrication of TiO₂ nanotube by anodization

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TiO₂ nanotube preparation method has been established for the application for a bio-sensor, a solar cell and a PEC (photoelectrochemical cell), recently. On the other hand, the understandings for the mechanism of the TiO₂ nanotube growth and the properties of one-dimensional TiO₂ array are not known. Anatase TiO₂ nanotubes formed by anodic oxidation on a pure titanium substrate which controllable good uniformity at room temperature in [F⁻] containing electrolyte. NH₄F or HF was used as a fluoride ion source and ethylene glycol and H₂O was used as solvent.

A mechanism of the formation of the TiO₂ nanotubes was studied based on the observation of the surface morphology (top-view and cross-sectional view) using FE-SEM, depth profiles by Auger analysis and the analysis of the current density-time curves between different concentration of electrolyte containing (0.2wt%~0.5wt%). The crystal structures of the TiO₂ nanotubes were confirmed using X-ray diffraction (XRD). The prepared TiO₂ nanotubes were annealed at temperature ranges from 250°C to 450°C in dry oxygen ambient for an hour and the structural changes were monitored. From the depth profiles, the mechanism of TiO₂ nanotube growth is discussed.