

## **Preparation and characterization of nanostructured TiO<sub>2</sub> via electrochemical anodization in aqueous ammonium fluoride**

### **ABSTRACT**

Electrochemical anodization of titanium (Ti) in acidic fluorinated electrolyte has emerged as a simple and straightforward method to synthesize TiO<sub>2</sub> coating on Ti substrates directly. In this study, attempt was made to perform the anodic oxidation of Ti foil in a standard two-electrode bath containing relatively mild electrolyte, NH<sub>4</sub>F at various potentials for 1 hour. The resulting TiO<sub>2</sub> films were characterized with X-ray Diffraction (XRD), Field Emission Scanning Electron Microscopy (FESEM) and linear sweep photovoltammetry. XRD analysis revealed the amorphous nature of the as-anodized samples which crystallize after calcination in open air atmosphere at 500 °C for 2 hours. TiO<sub>2</sub> films synthesized via anodization on polished Ti substrate demonstrated pure anatase phase only whereas anodization of etched Ti foil with HNO<sub>3</sub> showed a mixture of anatase and rutile phase. Different morphologies of TiO<sub>2</sub> could be obtained depending on the applied voltage used. Both as-anodized and calcined TiO<sub>2</sub> films showed photocurrent response when illuminated from 300 W halogen lamp with that synthesized via anodization of etched Ti foil exhibited relatively higher photocurrent than the other samples, demonstrating the important of surface treatment of Ti on the photoelectrochemical response of TiO<sub>2</sub> film.

**Keyword:** Nanostructure; Titanium dioxide; Morphology; Anodic oxidation