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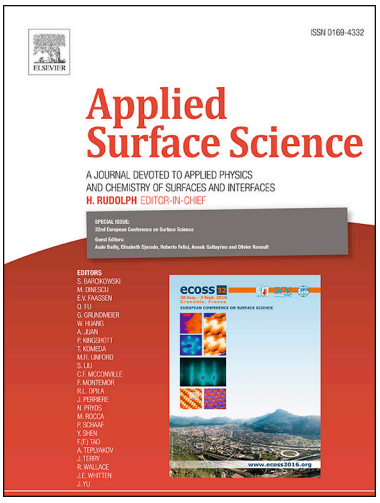

Full Length Article

Effects of fluoride source on the characteristics of titanium dioxide nanotubes

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EFFECTS OF FLUORIDE SOURCE ON THE CHARACTERISTICS OF TITANIUM DIOXIDE NANOTUBES

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Abstract

Nanotubes were obtained from commercially pure titanium by anodization at 20 V in an aqueous solution of acetic acid (14% v/v) with three different sources of fluoride ion (HF, NaF, and NH_4F). The use of the same anodization conditions allowed to study the effect of each fluoride source on the morphological characteristics of the nanotubes. The nanotubes produced had a wide variation in terms of internal diameter and polygon shape. The thickness of the porous coating produced in HF solution was around half that produced in salts (NaF and NH_4F) containing electrolytes, whereas the barrier layer thickness at the pore base was the same for all the anodic coatings produced. To the best of our knowledge, for the first time, the existence of titanium suboxides in the nanotubes, both with and without heat treatment, was clearly observed by HRTEM; d-spacings were measured and correlated with the possible crystalline phases. The presence of titanium suboxides in the titanium dioxide nanotubes may improve the corrosion resistance and conductance of these materials. SAED and XRD did not show evidence of these titanium suboxides; only peaks associated with rutile and anatase phases were identified. High-resolution chemical analysis indicated that the fluoride content was higher at the nanotube base than at the nanotube tip in all coatings.

Keywords: TEM Analysis; TiO_2 Nanotubes; Anodization; Raman Characterization; XRD Characterization.