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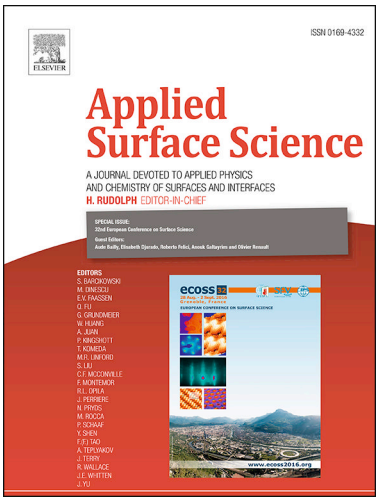

Full Length Article

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Depth elemental characterization of 1D self-aligned TiO_2 nanotubes using calibrated Radio Frequency Glow Discharge Optical Emission Spectroscopy (GDOES)

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Abstract

In this work we study the depth composition of anodic TiO_2 nanotube layers. We use elemental depth profiling with Glow Discharge Optical Emission Spectroscopy and calibrate the results of this technique with X-ray photoelectron spectroscopy (XPS) and energy dispersive spectroscopy (EDS). We establish optimized sputtering conditions for nanotubular structures using the pulsed RF mode, which causes minimized structural damage during the depth profiling of the nanotubular structures. This allows to obtain calibrated sputter rates that account for the nanotubular "porous" morphology. Most importantly, sputter-artifact free compositional profiles of these high aspect ratio 3D structures are obtained, as well as, in combination with SEM, elegant depth sectional imaging.

Keywords: TiO_2 nanotube, anodization, depth profile, glow discharge optical emission spectroscopy