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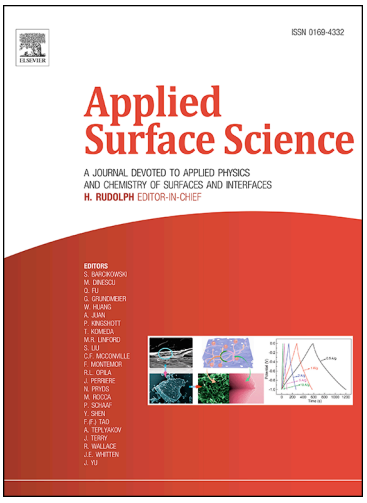

Full Length Article

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PII: S0169-4332(18)32509-1
DOI: https://doi.org/10.1016/j.apsusc.2018.09.093
Reference: APSUSC 40397

To appear in: *Applied Surface Science*

Received Date: 18 April 2018
Revised Date: 6 September 2018
Accepted Date: 10 September 2018

Please cite this article as: J. Venturini, F. Bonatto, W.C. Guaglianoni, T. Lemes, S. Arcaro, A. Kopp Alves, C.P. Bergmann, Cobalt-doped Titanium Oxide Nanotubes Grown via One-Step Anodization for Water Splitting Applications, *Applied Surface Science* (2018), doi: https://doi.org/10.1016/j.apsusc.2018.09.093

Cobalt-doped Titanium Oxide Nanotubes Grown via One-Step Anodization for Water Splitting Applications

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ABSTRACT

Titanium dioxide (TiO_2) is one of the most utilized materials for water splitting applications; nonetheless, its poor exciton separation is a major hurdle towards its full realization as a catalyst for hydrogen (H_2) production. This work presents a successful one-step method for the preparation of cobalt-doped TiO_2 nanotubes. The wafers were prepared via the anodization of metallic titanium foils at two different potentials (20 and 60 V) in a cobalt-enriched electrolyte, in the presence of diethylenetriamine-pentaacetic acid (DTPA). Scanning Electron Microscopy (SEM) images of the prepared samples demonstrate the successful synthesis of homogeneous nanotube arrays. X-ray diffractometry and Raman spectroscopy confirm the insertion of cobalt as a dopant inside the anatase framework. Furthermore, the diffuse reflectance spectra of the samples are strongly affected by the presence of the dopant. As a consequence of the successful insertion, the current density developed by the doped samples under illumination is greatly enhanced, reaching up to a fourfold increase for the 60 V sample at a potential where the electrolysis of water takes place. The developed one-step method shows therefore great promise for future application in the production of photoelectroactive materials for H_2 production.

Keywords: Titanium dioxide; TiO_2 nanotubes; cobalt; water splitting.