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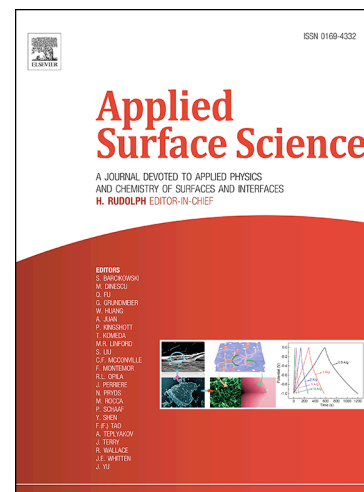
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Cobalt-doped Titanium Oxide Nanotubes Grown via One-Step Anodization for Water Splitting Applications

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ABSTRACT

Titanium dioxide (TiO₂) 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 (H₂) production. This work presents a successful one-step method for the preparation of cobalt-doped TiO₂ 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 H₂ production.

Keywords: Titanium dioxide; TiO₂ nanotubes; cobalt; water splitting.

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