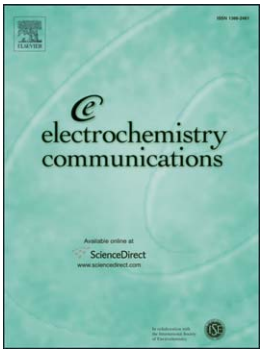

Facile preparation of extremely photoactive boron-doped TiO_2 nanotubes arrays

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Facile preparation of extremely photoactive boron-doped TiO_2 nanotubes arrays

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ABSTRACT

Doping of TiO_2 nanotube arrays with boron was realized *via* electrochemical treatment of as-anodized titania immersed in electrolyte containing boric acid. The photoactivity of doped and pure titania was examined by means of photoelectrochemical and photocatalytic response under UV-vis irradiation. The results showed that photocurrent density of B-TNTs is remarkably higher (7.5 times) than density of pure TiO_2 nanotube arrays. Furthermore, the usage of doped samples as a catalytic material leads to a significant improvement in decomposition efficiency of methylene blue and in the efficient formation of hydroxyl radicals than is the case in the presence of titania.

Keywords: anodization, nanotube, boron-doped, photoactivity, titanium dioxide

1. Introduction

Titanium dioxide nanotube arrays (TNTs) have been extensively used during the last two decades in various fields, namely: the removal of organic and inorganic pollutants [1], generation of hydrogen from water decomposition [2], air purification [3], gas sensing [4] and solar cells [5]. Such a wide range of TNTs' applications results from their high surface area, excellent chemical stability and non-toxicity [6]. However, in order to take advantage of this material in processes initiated by solar radiation, the problem concerning reduced photoactivity limited only to UV light and resulting from its wide band gap (E_g=3.2 eV), should be overcome [7]. Therefore, many efforts have been directed at narrowing the energy band gap in order to activate the material in the visible spectral range, which would be of great use in photocatalysis and other applications of TNTs. There have been proposed