World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:12, No:07, 2018

Green Synthesized Palladium Loaded Titanium Nanotube Arrays for Simultaneous Azo-Dye Degradation and Hydrogen Production

Authors : Yen-Ping Peng, Ku-Fan Chen, Ken-Lin Chang, Jian Sun

Abstract : In this study, palladium loaded titanium dioxide nanotube arrays (Pd/TNAs) was successfully synthesized by anodic oxidation etching method combined with microwave hydrothermal method, using tea or coffee as a green reductant. Pd/TNAs was employed as an electrode in a photoelectrochemcial (PEC) system to simultaneously remove azo-dye and to generate hydrogen in the anodic and cathodic chamber, respectively. The chemical and physical properties of as-synthesized Pd/TNAs were characterized by scanning electron microscopy (SEM), ultraviolet–visible spectroscopy (UV-vis), X-ray diffraction (XRD), and X-ray photoelectron spectroscopy (XPS). SEM image indicates the diameter and the length of Pd/TNAs were approximately 300 nm and 2.5 μm, respectively. XPS analyses indicate that 1.13% (atomic %) of Pd was loaded onto the surface of TNAs. UV-vis results show that the band gap of TNAs was reduced from 3.2 eV to 2.37 eV after Pd loading. In addition, the electrochemical performances of Pd/TNAs were investigated by photocurrent density test and electrochemical impedance spectroscopy (EIS). The photocurrent (4.0 mA/cm^2) of Pd /TNAs was higher than that of the uncoated TNAs (1.4 mA/cm^2) at a bias potential of 1 V (vs. Ag/AgCl), indicating that Pd/TNAs-C can effectively separate photogenerated electrons and holes. The mechanism of our PEC system was proposed and discussed in detail in this study.

Keywords : Pd/TNAs, photoelectrochemical, azo-dye degradation, hydrogen generation
Conference Title : ICWMEEE 2018 : International Conference on Waste Management, Ecological and Environmental Engineering
Conference Location : Stockholm, Sweden
Conference Dates : July 12-13, 2018

Open Science Index, Environmental and Ecological Engineering Vol:12, No:07, 2018 publications.waset.org/abstracts/80237.pdf