Photocatalytic degradation of herbicides under visible light using Pd-WO3 nanorods

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Abstract

A hydrothermal method was used to prepare a tungsten trioxide (WO3) nanorod, and a photo-assisted method was used to deposit palladium metal onto its surface. Various techniques were used to characterize the WO3 and Pd-WO3 nanorods. The results reveal tungsten trioxide to have a nanorod shape and that palladium was deposited as dots on the tungsten trioxide surface. Additionally, we noticed that the form of palladium on the surface of WO3 nanorods is metallic palladium and that palladium is well dispersed over the WO3 nanorod surface. To measure the photocatalytic activity of WO3 and Pd-WO3 nanorods, the degradation of 2,4-dichlorophenoxyacetic acid (2,4-D) under visible light was studied. The photocatalytic activity of the Pd-WO3 nanorods was higher than that of the WO3 nanorods. In addition, the photocatalytic activity of Pd-WO3 nanorods increased with an increasing weight percentage of doped palladium. The highest photocatalytic activity, lowest band gap energy and lowest electron-hole recombination time were measured for 0.15 wt% Pd-WO3 nanorods. Finally, the photocatalytic stability of 0.15 wt% Pd-WO3 nanorods allowed their reuse for the degradation of 2,4-D five times without loss of activity. (C) 2016 Elsevier Ltd and Techna Group S.r.l. All rights reserved.

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