Preparation of Tungsten Trioxide Nanorods by Hydrothermal Route: n-Tungsten Trioxide Nanorods/p-Silicon p-n Junction

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Abstract

Nanocrystalline tungsten oxide (WO3) has unique properties and immense application potential toward nanodevice fabrication. The WO3 nanorods were successfully synthesized via a facile hydrothermal reaction technique at low temperature using phosphotungstic acid and urea for the first time. This method provides a fast, simple, low cost and green large scale route to produce monoclinic WO3 nanorods. The purity, microstructure, morphology of the WO3 nanorods were examined in terms of X-ray diffraction, energy dispersive X-ray spectrum, field emission scanning electron microscopy, and transmission electron microscopy. The synthesized WO3 nanorods had a monoclinic structure with high purity with mean diamter 14 nnn and the mean length 118 nm. The WO3/p-Si/Al heterostructure demonstrated a very high rectification ratio of 1.397 x 10(4) at a +/- 5 V bias voltage. The dependence of the electrical characteristics of WO3/p-Si/Al diode on the illumination were investigated. The photocurrent in the reverse biased I-V measurement were found to be strongly illumination dependent. The interface state density for the Al/WO3/p-Si diodes was found to be similar to 10(14) (eV(-1) cm(-2)). This indicates that the interface between p-Si and WO3 has various kinds of interface states. The obtained results suggest that the WO3/p-Si/Al photodiode can be used for visible light sensor applications.

Keywords

Author Keywords: WO3 Nanorods; Microstructure; Electrical Parameters; Heterojunction
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