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

By: Al-Ghamdi, AA (Al-Ghamdi, Ahmed A.)^[1]; Bostanci, H (Bostanci, H.)^[2]; Al-Hartomy, OA (Al-Hartomy, Omar A.)^[1,3]; Soylu, M (Soylu, M.)^[4]; El-Tantawy, F (El-Tantawy, Farid)^[5];

Yakuphanoglu, F (Yakuphanoglu, F.)^[1,2]

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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 diameter 14 nm and the mean length 118 nm. The WO₃/p-Si/Al heterostructure demonstrated a very high rectification ratio of 1.397 x 10⁴ 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 10¹⁴ (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

KeyWords Plus: SOL-GEL METHOD; SCHOTTKY DIODES; THIN-FILMS; OXIDE; SENSORS; NANOPARTICLES; SPECTROSCOPY

Author Information

Reprint Address: Yakuphanoglu, F (reprint author)

+ King Abdulaziz Univ, Dept Phys, Fac Sci, Jeddah 21589, Saudi Arabia.

Addresses:

- + [1] King Abdulaziz Univ, Dept Phys, Fac Sci, Jeddah 21589, Saudi Arabia
- + [2] Firat Univ, Dept Phys, Fac Sci, TR-23119 Elazig, Turkey
- [3] Univ Tabuk, Dept Phys, Fac Sci, Tabuk 71491, Saudi Arabia
- + [4] Bingol Univ, Dept Phys, Fac Arts & Sci, TR-12000 Bingol, Turkey
- + [5] Suez Canal Univ, Dept Phys, Fac Sci, Ismailia 41522, Egypt

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