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Temperature Dependant Structural and Electrical Properties of ZnO Nanowire Networks

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Abstract

In this paper, we report a successful growth of zinc oxide nanowire networks by simple thermal evaporation process using metallic zinc powder in the presence of oxygen. The morphological investigations of the synthesized nanowire networks are conducted by using field emission scanning electron microscopy (FESEM) which reveals that the grown products are in high-density over the whole substrate surface and possessing nanowire networks like structures. The structural and compositional properties of the grown nanowire networks are analyzed by X-ray diffraction (XRD), transmission electron microscopy (TEM) and energy dispersive spectroscopy (EDS), respectively which confirm that the synthesized products are well-crystalline, with wurtzite hexagonal phase ZnO. The as-grown ZnO nanowire networks grown on silicon substrate are utilized to fabricate n-ZnO/p-Si heterojunction diode and presented in this paper. The I V characteristics of the fabricated heterojunction diode at different temperatures (77 K-477 K) are also investigated. High values of quality factor, which are obtained from this study, indicate a non-ideal behavior of the fabricated device. The mean barrier height of similar to 0.84 eV is also estimated and presented in this paper.

Keywords

Author Keywords: ZnO; Nanowire Networks; Structural Characterizations; Electrical Properties; I-V Characteristics; Heterojunction Diodes

KeyWords Plus: LIGHT-EMITTING-DIODES; OPTICAL-PROPERTIES; SI HETEROJUNCTION; THIN-FILMS; GROWTH; NANORODS; HETEROSTRUCTURES; DEVICES; SILICON; FIELD

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