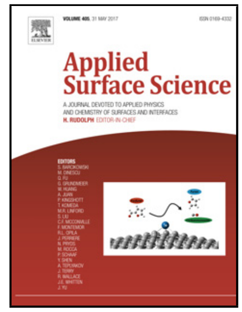
Accepted Manuscript



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PII: S0169-4332(17)30835-8
DOI: http://dx.doi.org/doi:10.1016/j.apsusc.2017.03.154
Reference: APSUSC 35530

To appear in: *APSUSC*

Received date: 18-11-2016
Revised date: 7-3-2017
Accepted date: 17-3-2017

Fabrication of Ag/ZnO heterostructure and the role of surface coverage of ZnO microrods by Ag nanoparticles on the photophysical and photocatalytic properties of the metal-semiconductor system

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Abstract

This report presents findings on microstructural, photophysical, and photocatalytic properties of Ag/ZnO heterostructure grown on flexible and silicon substrates. ZnO microrods are prepared by thermal decomposition method for different solute concentrations and Ag/ZnO heterostructure are fabricated by photo-deposition of Ag nanoparticles on ZnO microrods. X-ray diffraction and electron microscopy studies confirm that ZnO microrods belong to the hexagonal wurtzite structure and grown along [001] direction with random alignment showing that majority microrods are aligned with (100) face parallel to the sample surface. Plasmonic Ag nanoparticles are attached to different faces of ZnO. In the optical reflection spectra of Ag/ZnO heterostructure, the surface plasmon resonance peak due to Ag nanoparticles appears at 445 nm. Due to the oxygen vacancies the band gaps of ZnO microrods turn out to be narrower compared to that of bulk ZnO. The presence of Ag nanoparticles decreases the photoluminescence intensity which might be attributed to the non-radiative energy and direct electron transfer in the plasmon-exciton system. The quenching of photoluminescence in Ag/ZnO heterostructure at different growth conditions depend on the extent of surface coverage of ZnO by plasmonic Ag nanoparticles. Photocatalytic degradation efficiency of Ag/ZnO heterostructure is higher than that of ZnO microrods. The