ZnO and Related Nanostructures for Electronics and Photonics

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Abstract

Zinc oxide (ZnO) and its associated nanostructures have been vigorously pursued for application in advanced electronics, UV detectors, chemical sensors and source for white light. The material with a bandgap of 3.37eV, that could be tailored by the addition on Mg or Co, is unique in being biocompatible and exhibiting both semiconducting and piezoelectric properties that grows in a diverse group of nanostructure morphologies. Highly ordered vertical arrays of ZnO nanowires (NWs) have been grown on substrates including silicon, SiO_2, GaN, and sapphire using a metal organic chemical vapor deposition (MOCVD) growth process. Co-axial core-shell nanostructures demonstrating unique properties with enhanced detectability of chemical species has been demonstrated. In this talk, we will present a comparison of the different growth techniques for the growth of $Zn_{1-x}Mg_xO$ nanorods and nanowires. Sonochemical growth that provides a low temperature technique for enhanced Mg incorporation will be discussed. Structural and optical properties of the grown vertically aligned ZnO NW arrays characterized by scanning electron microscopy (SEM), X-ray diffraction (XRD), and photoluminescence (PL) will be presented and discussed. The talk will conclude by highlighting some electronic/photonic device/system demonstration