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Defects in zinc oxide nanowires: Temperature evolution and the effect on contacts

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Nanostructured zinc oxide materials have received attention for their novel electrical, mechanical, chemical and optical properties resulting from surface and quantum confinement effects. The strong piezoelectric and pyroelectric properties can be used for mechanical actuators and piezoelectric sensors. The wide 3.37 eV band gap can be used for short wavelength optoelectronic applications. The material is transparent to visible light and can be doped, with applications including photonics and optical sensors. As with all nanostructures, inherent defects incorporated during the growth of ZnO nanowires (NWs) can dominate the novel properties. This paper will present combined X-ray photoelectron (XPS)/scanning tunneling spectroscopy (STS)/photoluminescence (PL) studies of hydrothermally grown ZnO NWs, in which surface defects are controllably changed by vacuum annealing. A transport model developed to study gold contacts to ZnO NWs is adapted to study the effect of this change in surface defect states on contacts to NWs with high surface defect densities. Together the results elucidate the origin of the defects and their role in modifying the electrical behaviour of contacted ZnO NWs.

Biography

Richard J Cobley completed his PhD in 2005 at Swansea University. He was awarded a Royal Academy of Engineering Research Fellowship in 2007 to study errors inherent in nanoscale measurement of electronic material properties. He is now a senior lecturer in the College of Engineering where his work concerns nanoscale measurement of materials and devices with a particular focus on modeling and removing the increased measurement error which arises with nanoscale techniques.

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