Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Copper Incorporation into ZnO Nanowires SUSIE EUSTIS, DOUGLAS MEIER, BABAK NIKOOBAKHT, NIST — The applications of zinc oxide (ZnO) nanowires (NWs) in devices are promising due to the optical, mechanical and electrical properties of these one-dimensional structures, but current uses are limited by the ability to produce high quality nanowires at desired locations. Copper is an attractive catalyst for generating zinc oxide nanowires due to the long length and high density of ZnO NWs produced. However, defects due to impurities, oxygen deficiencies, and structural defects lead to decreased optical and electrical transport. Photoluminescence (PL) microscopy found that ZnO NWs grown by high temperature evaporation on a bulk copper substrate display the expected band gap emission at 380nm. A larger visible emission is also observed in the PL spectrum around 520nm due to defect states. High-resolution transmission electron microscopy (HR-TEM) shows the ZnO nanowires are single crystalline with hexagonal structure. The metallic tip shows a polycrystalline structure in HR-TEM images. Energy dispersive x-ray spectroscopy (EDS) mapping and auger electron spectroscopy (AES) clearly show copper throughout the length of the nanowire, which is most likely responsible for the strong deep trap emission from these nanowires. AES also finds large amounts of oxygen on the surface of these NWs, a further contributor to defect emission states.

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Date submitted: 14 Nov 2007 Electronic form version 1.4