

Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Growth of ZnO Nanotube without catalyst and templates YOKE

KHIN YAP, Michigan Tech University, SAMUEL MENSAH, Michigan Tech University, VIJAYA KAYSTHA, Michigan Tech University — Nanotubular structures of oxides materials have recently gained attention for their hydrophilic properties. These oxide nanotubes are attracting interest for biological applications including nanofluidic devices for single DNA molecule sensing, rapid disease diagnosis and DNA sequencing. Here we show that tubular cavities of ZnO can be directly grown on substrates without the use of catalyst and templates. This is obtained by the evaporation and the condensation of a mixture of ZnO and graphite powders in a double-tube vapor-phase transport system. Field-emission scanning electron microscopy (FESEM), high-resolution transmission electron microscopy (HRTEM), X-ray powder diffraction, Raman spectroscopy and photoluminescence (PL) were employed to study and characterize the tubular structures. Results show that these tubular structures were single crystals of pure hexagonal Wurtzite structure. Our results show that rapid cooling rate and deficiency of oxygen during cooling contributed to the tubular ZnO nanostructures. A growth model and possible reasons for the growth of ZnO nanotubes will be discussed at the meeting.

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Date submitted: 30 Nov 2005

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