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Electrical and Photoconductive Properties of Vertical ZnO Nanowires in High Density Arrays ZHIYONG FAN, DEEPANSHU DUTTA, CHUNG-JEN CHIEN, EVAN C. BROWN, PAI-CHUN CHANG, JIA GRACE LU, University of Southern California — High density vertical zinc oxide nanowire arrays were synthesized using highly ordered channels in anodic alumina membranes via catalytic chemical vapor deposition assisted by electrochemical deposition methods. The anodic alumina membranes were fabricated using a two-step anodization method. High resolution transmission electron microscopy and energy dispersive x-ray microanalysis studies revealed that the nanowire growth was governed by a vapor-liquid-solid mechanism, and the nanowires are single crystalline grown along the [001] direction. Using conductive atomic force microscopy (AFM), the electrical transport and photoconduction of individual vertical nanowires were investigated. The role of the AFM probe coating on the $I-V$ characteristics will be presented. A negative photoconductivity was first observed as a result of electron trapping in the alumina membrane due to its duplex oxide layered structure. In contrast, positive photoconductivity was observed using a thermally annealed anodic alumina membrane as the nanowire growth template. These studies render a pathway for constructing high density nanoscale electronic and optoelectronic circuits.

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