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Experimental Study of Electrical Properties of ZnO Nanowire Random Networks for Gas Sensing and Electronic Devices DAQING ZHANG, CSU Fresno, SIRISHA CHAVA, CHRIS BERVEN, Univ. of Idaho, ANIRBAAN MUKHERJEE, VANVILAI KATKANANT, CSU Fresno — ZnO nanostructures are an attractive material for electronic and optical applications due to their many unique properties. Our research focuses on studying mats of ZnO nanowires as an electronic material with particular interest in their interaction with various gases. The ZnO nanowires were synthesized on sapphire substrates using a tube furnace at atmospheric pressure. Two-terminal current-voltage (I-V) measurements were used to examine the electrical conductivity of the ZnO nanowire mat as a function of temperature and exposure to various gases. Temperature-dependant measurements were performed in vacuum using a continuous flow cryostat over $\sim$150 K to $\sim$ 300 K. Gas exposure experiments were conducted in a custom-built environmental chamber which was filled with various testing gases (Ar, CO, CO_2, H_2) at 3psig or under vacuum. We observed reversible changes in the I-V characteristics as a function of gas exposure. For CO, the currents increased by a factor of about four. In addition, changes in the I-V behavior were found to be reversible after evacuation. Possible mechanisms for the gas-specific responses of the ZnO nanowire mat will be discussed.

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