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Synthesis, transport studies and applications of In2O3 nanowires
DAIHUA ZHANG, CHAO LI, BO LEI, CHONGWU ZHOU, University of Southern California — Single-crystalline indium oxide nanowires were synthesized using a laser ablation method and characterized using various techniques. Precise control over the nanowire diameter down to 10 nm was achieved by using monodisperse gold clusters as the catalytic nanoparticles. In addition, field effect transistors with on/off ratios as high as 10^4were fabricated based on these nanowires. Detailed electronic measurements confirmed that our nanowires were n-type semiconductors with thermal emission as the dominating transport mechanism, as revealed by temperature-dependent measurements. Furthermore, we studied the chemical sensing properties of our In_2O_3nanowire transistors at room temperature. Upon exposure to a small amount of NO_2, the nanowire transistors showed a decrease in conductance of up to six orders of magnitude, in addition to substantial shifts in the threshold gate voltage. Our devices exhibit significantly improved chemical sensing performance compared to existing solid-state sensors in many aspects, such as the sensitivity, the selectivity, the response time and the lowest detectable concentrations. We have also demonstrated the use of UV light as a ?gas cleanser? for In_2O_3nanowire chemical sensors, leading to a recovery time as short as 80seconds.

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