Novel Synthesis and Characterization of Antimony and Lithium Doped Tin Dioxide Nanocrystals Achieving Record Gas Sensor Performance

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In this current study, highly crystalline undoped, N- and P-doped tin dioxide (SnO_2) nanocrystals were successfully synthesized and gas sensors fabricated achieving exceptional sensor performance. Novel sol-gel precipitation method was used for the synthesis. N- and P-doping in SnO_2 were achieved with Antimony and Lithium respectively. Nanocrystals of 10-30 nm were achieved with uniform Cassiterite phase. Sensors from all three classes of nanocrystals were subsequently fabricated and characterized for their bandgap properties, I-V characteristics and sensing performance. Both P- and N-doped SnO_2 showed a bandgap of 3.84-3.85eV suggesting little effect of doping on the electronic properties. I-V characteristics indicate a strong Ohmic behavior for all three types of sensors. Sensor performance was determined to be excellent, particularly with Lithium doped SnO_2 sensor, with response time of less than 30s for 0.3% H_2. A very high sensor sensitivity of ~9% achieved for Li doped SnO_2 for 0.3% H_2.

Awards Won:

Second Award of $2,000