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

Murthy, Nikhil

In this current study, highly crystalline undoped, N- and P-doped tin dioxide (SnO2) 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 SnO2 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 SnO2 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 SnO2 sensor, with response time of less than 30s for 0.3% H2. A very high sensor sensitivity of ~9% achieved for Li doped SnO2 for 0.3% H2.

Awards Won:

Second Award of $2,000