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Tailoring electronic properties of SnO_2 nanobelts via thermal annealing TIMOTHY KEIPER, JORGE BARREDA, JOON-IL KIM, Department of Physics, Florida State University, JIM P. ZHENG, Electrical and Computer Engineering, FAMU/FSU College of Engineering, PENG XIONG, Department of Physics, Florida State University — Metal oxide semiconductors nanowires are a viable option for the fabrication of transistors with desirable characteristics for nanoelectronic and sensing applications. SnO_2 nanobelts (NBs) have been synthesized using catalyst-free chemical vapor deposition. The growth parameters have been explored, producing NBs as long as millimeters. These NBs have been demonstrated as effective channel-limited gas [1], pH [2] and protein [3] field-effect transistor (FET) sensors. Through modification of O_2 and vacuum thermal annealing conditions, we investigate the control and optimization of the electronic properties of the NBs to achieve desired device characteristics for biosensing applications. A pronounced increase in conductance, up to the order of microsiemens, has been observed in annealed NBs under O_2 environment at elevated temperatures above 600°C. We also examine the properties of the electrical contacts with different metallization and varying NB conductivity. Optimal device characteristics for various sensing applications will be tested and discussed.

[1] L.L. Fields et al., Appl. Phys. Lett. 88, 263102 (2006).
[2] Yi Cheng et al., Nano Lett. 8, 41794184 (2008).
[3] Yi Cheng et al., Biosensors and Bioelectronics 26, 4538-4544 (2011).

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