Electronic Supplementary Information

for:

SnO Mesocrystals: Additive-free Synthesis, Oxidation, and Top-Down Fabrication of Quantum Dots

Junhua Zhao,[a] *Ruiqin Tan,*[b] *Yanqun Guo,*[a] *Yuehui Lu,*[a] *Wei Xu,*[a] *Weijie Song**[a]

[a] Ningbo Institute of Material Technology and Engineering, Chinese Academy of Sciences, Ningbo, 315201, P. R. China.

[b] Faculty of Information Science and Engineering, Ningbo University, Ningbo, 315211, P. R. China.

*Corresponding author: Fax: +86-574-86685043; Tel.: +86-574-87913375; E-mail: weijiesong@nimte.ac.cn

S1. Synthesis

All reagents were analytically pure and purchased from Sinopharm Chemical Reagent Co. and used without further purification. To prepare the SnO mesocrystals, $SnCl_2 \cdot 2H_2O$ (8 mmol) was dissolved in distilled water under vigorous magnetic stirring. The sodium hydroxide (0.5 M) was then slowly added to the solution in order to adjust the pH to 11.8. The obtained mixture was maintained under continuous magnetic stirring for 1 h and then transferred into a Teflon-lined stainless steel autoclave, sealed and maintained at 180 ℃ for 12 h. The light-yellow precipitate was washed with distilled water and ethanol respectively until Cl-ions could not be detected. The products were finally dried in the air at 60 ℃ in 63% yield. SnO_2 mesocrystals were synthesized by the annealing of SnO mesocrystals in an oxygen atmosphere at 600 °C for 4 h. The suspensions of SnO and SnO_2 QDs were prepared by ultrasonic agitation in yield of 65% and 61%, respectively. Sensor devices were fabricated by casting drops of the obtained 10 wt.% SnO or SnO/SnO_2 mixture (1:1, mol ratio) suspensions on alumina substrates (4 × 12 × 0.5 mm), and then annealed at 60 ℃ for 30 min.

S2. Characterization

The synthesized products were characterized by powder X-ray diffraction (XRD) (Bruker AXS D8 Advance, Bruker AXS GmbH, Karlsruhe, Germany), scanning electron microscope (SEM) (Hitachi S-4800, Hitachi, Tokyo, Japan), transmission electron microscope (TEM) (Tecnai F20, FEI Corp., USA). X-ray Photoelectron Spectra (XPS) were obtained using a Kratos Axis Ultra DLD spectrometer (AXIS-ULTRA DLD, Kratos, Japan) with a monochromated Al-Ka X-ray source (hv = 1486.6 eV). All the charging

shifts were calibrated referring to the binding energy (BE) of C 1s (284.8 eV).

The electrical *I-V* characterizations were performed using a LK1100 electrochemical analyzer. NO and NO_2 gases were used as the testing gas. The baseline resistance of the sensor was stabilized in a background flow of 79/21 N_2+O_2 to simulate the ambient air. The response time was defined as the time necessary for the resistance to increase from R_0 to $0.90R_{max}$.

S3. Results

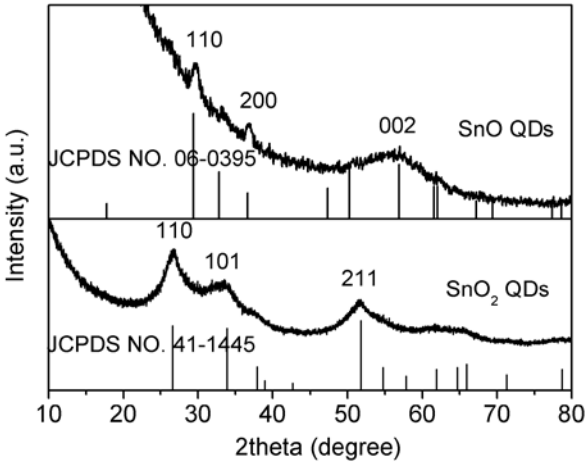

Fig. S1 XRD patterns of the SnO and SnO_2 quantum dots