Supporting Information for

Au-functionalized ZnO nanowire gas sensor for detection of benzene and toluene

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Summary

Five pages, including experimental details and 2 figures.

Experimental Details

Preparation of ZnO NWs.

A mixture of 1.52 g of $Zn(NO_3)_2 \cdot 6H_2O$ (0.128 mol/L), 20.00 g of Na_2CO_3 (1.6 mol/L) and 1.50 g of SDSN (0.138 mol/L) were dissolved in 40 mL of distilled water under stirring to form the supersaturated white slurry, which was then transferred to a 50 mL Teflon-lined stainless steel autoclave. The autoclave was sealed and maintained at 140 ^{o}C for 12 h. After the reaction was completed, the obtained white products were filtered off and centrifuged, then washed with plenty of distilled water and ethanol for several times, and then dried at 60 ^{o}C for 12 h.

Gas sensor fabrication and test.

Firstly, a proper amount of the materials was mixed with several drops of water to form slurry, which was then coated onto an alumina tube with a diameter of 1 mm and length of 4 mm, positioned with two Au electrodes and four Pt wires on each end. A Ni–Cr alloy filament was put through the alumina tube and used as a heater by tuning the heating voltage (V_h). The alumina tube was then welded onto a pedestal with six probes (Fig. S1a) to give the final sensor unit (Fig. S1b) and put on the circuit board (Fig. S1c). Gas sensing tests were performed on a commercial WS-30A Gas Sensing Measurement System (Wei Sheng Electronics Co., Ltd., Henan, China, Fig. S1d) using ambient air as the dilute and reference gas at an operating temperature of 340 ^{o}C and a relative humidity of 15-25%. A load resistance (R_L) is connected in series to the sensor. The sensor in the gas chamber was aged for several weeks before testing. The

gas concentrations were calculated according to the total volumes (18 L) of gas chamber. Different from the application of flow apparatus to measure different concentration of gases,[1-3] the tested gas such as toluene was introduced into the gas chamber by injecting a calculated volume of liquid with a microsyringe onto the heating board. The sensor signal voltage (V_{out}) was collected by a computer at a test circuit voltage of 5 V (V_c). The sensor was exposed to air again by opening the chamber when the test was completed. Fig. S1e shows the working principle of the WS-30A system.

References

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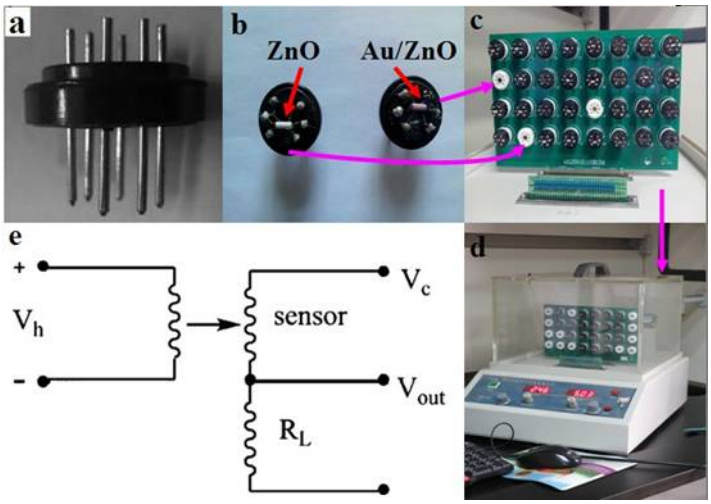

Fig. S1. Construction and test of gas sensor: sensor pedestal (a), completed sensor with alumina tube (b), circuit board (c), gas sensing measurement system (d) and working principle of gas sensor test (e).

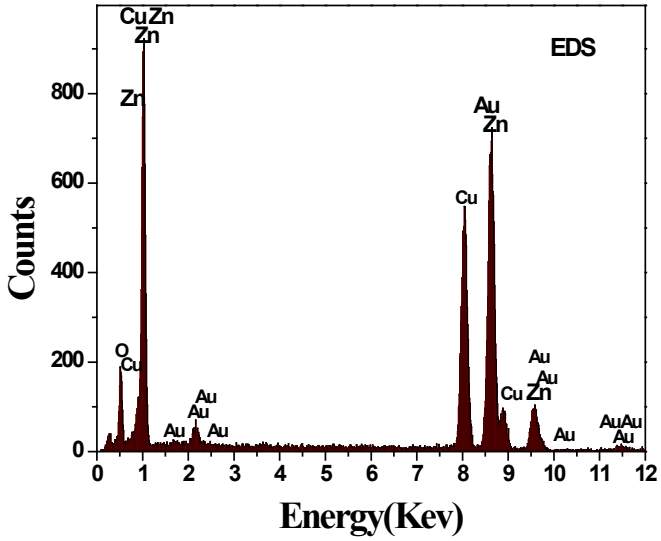

Fig. S2. EDS analysis from the magnified TEM image of the Au/ZnO NWs in Fig. 3e.