

† Electronic supplementary information

A fluorine-mediated hydrothermal method to synthesize mesoporous rhombic ZnO nanorod arrays and their gas sensor application

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Experimental section

The crystal phase identification of both the precursor and annealed products were investigated by X-ray diffraction (XRD, Bede D1) system with Cu- $K\alpha$ radiation ($\lambda = 0.15406$ nm) over the 2θ range of $10-80^\circ$. The morphologies were investigated using field emission scanning electron microscopy (FESEM, Hitachi S-4800) with an accelerating voltage of 5 kV. Specific surface areas were computed from the results of N_2 physisorption at 77 K (TriStar II 3020) by using the BET (Brunauer-Emmet-Teller) and BJH (Barrett-Joyner-Halenda). Further structural analysis of individual NR was carried out using high-resolution transmission electron microscopy (HRTEM, FEI F20) with an accelerating voltage of 200 kV. X-ray photoelectron spectroscopy (XPS, Thermo ESCALAB 250) measurement was performed with a monochromatic Al- $K\alpha$ ($h\nu = 1486.6$ eV) X-ray source. The electrical characteristics were measured at room temperature in the dark using a semiconductor parameter analyzer (Agilent E5270B) with the bias voltage range of -10 to 10 V. The gas-sensing properties were performed on an intelligent gas sensing analysis system (CGS-1TP, Beijing Elite Tech Co., Ltd, China). The gas response (S) was designated as the ratio R_a/R_g , where R_g was a mixture of target gas and air and R_a was the sensor resistance in air.

Figure S1

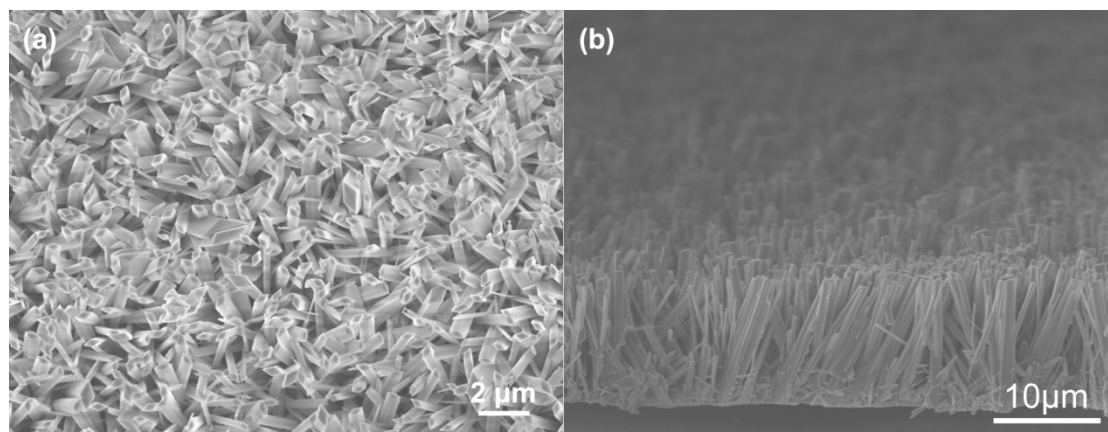


Fig. S1. (a) Top view and (b) cross-sectional SEM images of the rhombic ZnO nanorod arrays, respectively.

Figure S2

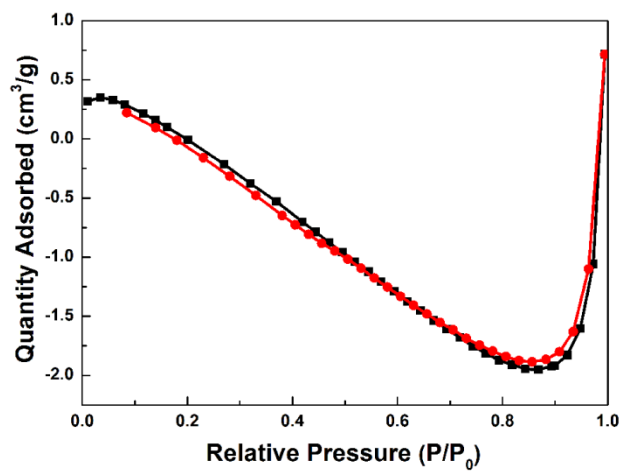


Fig. S2 N₂ adsorption/desorption isotherm curve of the rhombic Zn(OH)F nanorods.

Figure S3

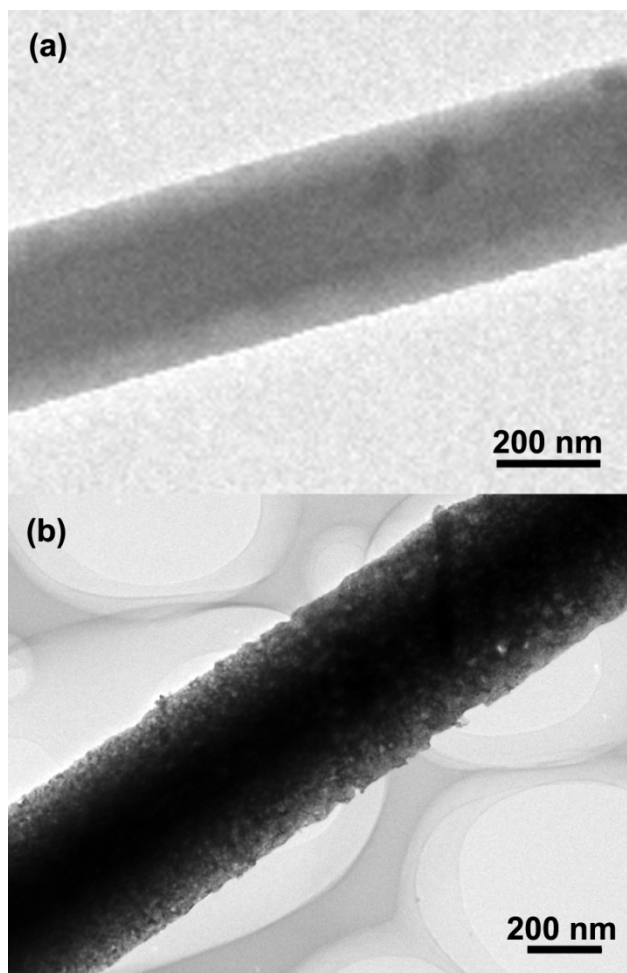


Fig. S3. TEM images of the rhombic nanorod: (a) the precursor Zn(OH)F and (b) ZnO after annealed at 450°C.

Figure S4

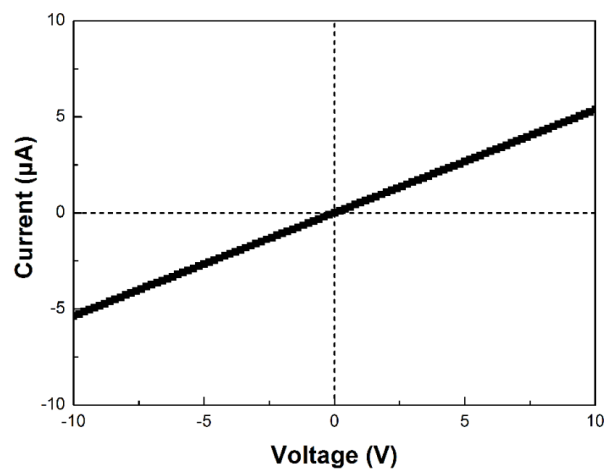


Fig. S4. I-V characteristics between the two neighboring electrodes, bridged by the mesoporous rhombic ZnO nanorod arrays, measured in air.