Supporting Information

Synthesis of Trapezohedral Indium Oxide Nanoparticles with High-Index {211} Facets and High Gas Sensing Activity

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1. Experimental detail

1.1 Materials

The synthesis of Trapezohedral Indium Oxide Nanoparticles was carried out using commercially available reagents. Indium (Ⅲ) acetate ($In(OOC_2H_5)_3$), trioctylamine (TOA, 98%), oleic acid (OA, 90%) were purchased from Alfa Aesar.

1.2 Preparation of Trapezohedral In_2O_3 Nanoparticles:

In a typical synthesis, 1.35 mL OA and 3.0 mL trioctylamine were mixed to form a transparent solvent at room temperature, then 0.1 g Indium (Ⅲ) acetate were add to the solvent and thoroughly dissolved under intense ultrasonic treatment. The resulting white solution was transferred into a glass tube with a length of 40 cm and 2.0 cm in diameter, and was directly placed in a veridical tube furnace that was already preheated to 320 ^oC. After the reaction for 30 min, the tube was taken out from the hot tube furnace and instantly added with ethanol. Finally, white products were collected by high-speed centrifugation. And then the samples before gas sensing were calcined at 400 °C for 6 h.

1.3 Characterization. The composition and phase of the as-prepared products were acquired by the powder X-ray diffraction (XRD) pattern using a Panalytical X-pert diffractometer with CuKα radiation. The morphology and crystal structure of as-prepared products were observed by scanning electron microscopy (SEM, S4800), and high-resolution transmission electron microscopy (HRTEM, FEI Tecnai-F30) with an acceleration voltage of 300 kV. All TEM samples were prepared from depositing a drop of diluted suspensions in ethanol on a carbon film coated copper grid.

1.4 Gas sensing test on trapezohedral In_2O_3 Nanoparticles:

The gas-sensing tests were performed in a WS-30A measuring system (Zhengzhou Winsen Electronics Technology, China). In a typical test, a gas sensor was fabricated by coating a certain amount of In_2O_3 paste (consisting of In_2O_3 particles and the ethanol solvent) onto a ceramic tube that was previously mounted with gold electrodes and platinum conducting wires. A resistor wire coil was inserted in the tube as a heater to provide working temperatures from 200 to 500 ^oC by varying the heating current. The analyses were injected either directly into the chamber or, in the case of liquids like ethanol, onto a metal-plate heater in the test chamber and evaporated completely by heating. The gas-sensing capability of the sensor was defined as the ratio R_{gas}/R_{air}, where Rgas and Rair are the electrical resistance of the sensor in test gas and in air at the working temperature of about 350 ^oC, respectively.

2 The experimental results

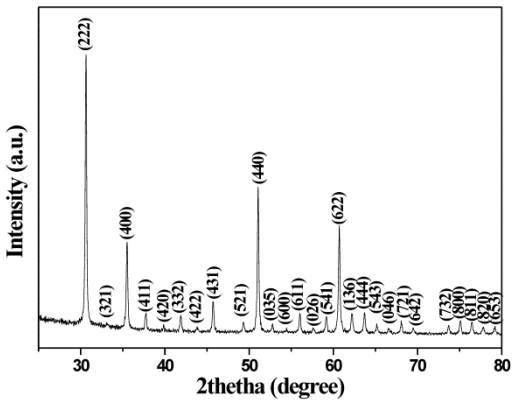

Fig. S1 the XRD pattern of the as-prepared products.

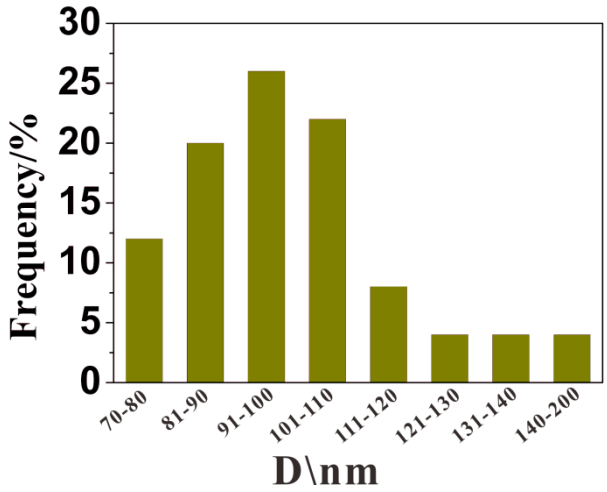

Fig. S2 the size distribution of the trapezohedraon-shaped In_2O_3 particles

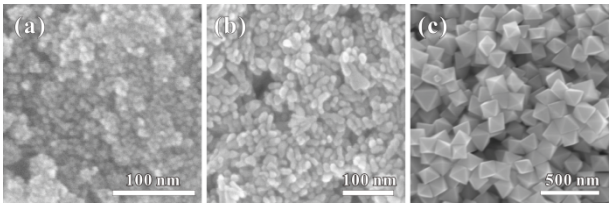

Fig. S3 The SEM images of In_2O_3 products prepared by the thermal decomposition of Indium (III) acetate in (a) air at 320 °C, (b) pure TOA at 320 °C, (c) a mixture of OA and TOA at 360 °C.

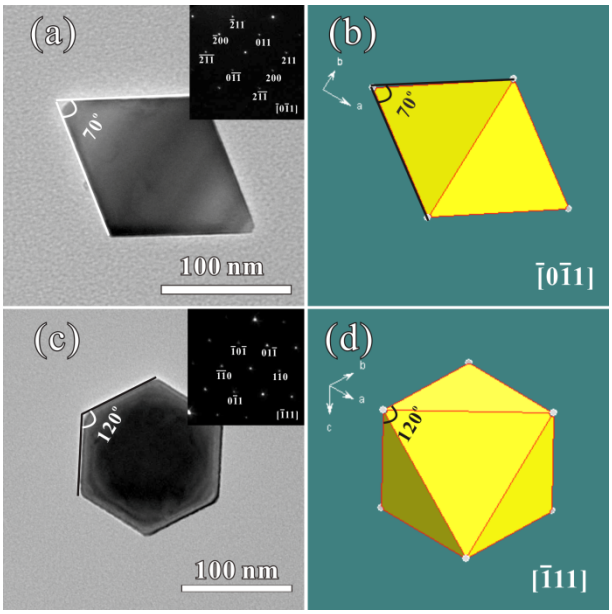

Fig. S4 (a) The TEM images of the individual octahedron-shaped In_2O_3 NCs projected from [0$\bar{1}$1] direction, top-right inset shows corresponding SAED pattern. (b) Schematic model of an ideal octahedron enclosed {111} facets viewed along the [0$\bar{1}$1] direction, (c) TEM image of the same octahedron-shaped In_2O_3 NCs particle viewed along [$\bar{1}$11] direction, inset: the corresponding SAED pattern, (d) chematic model of an ideal octahedron enclosed within {111} facets viewed along the [$\bar{1}$11] direction.