Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Experimental

All the chemicals were of analytical grade and used without further purification.

Hydrothermal Synthesis of SnO_2 nanocrystals In a typical synthesis of SnO_2 nanocrystals, 2 mmol of $SnCl_4 \cdot 5H_2O$ and 10 mmol of biuret were dissolved into 40 mL distilled water, respectively. Then, the mixture was hydrothermally reacted at 120 °C for 12 h. The obtained powder sample was centrifuged, washed with distilled water and ethanol, and dried at room temperature. To investigate the effect of biuret, we also conducted the experiment under the same hydrothermal condition with 0, 5, 20 mmol of biurea, respectively.

Characterization The morphology and structural characteristics were observed using X-ray diffraction (XRD, Rigaku D/max 2500 diffractometer) and transmission electron microscope (TEM; JEOL 2010 with an accelerating voltage of 200 kV),and N_2 adsorption−desorption(Micromeritics Instrument Corp.Gemini VII 2390 V1.03).

Gas sensing measurements The fabrication and testing principles of the gas sensor are similar to that described in our previous report.[1] Firstly, the gas-sensing samples were mixed with terpineol to form a paste and then coated onto the outside surface of an alumina tube with a diameter of 1 mm and a length of 5 mm. A platinum coil through the tube was employed as a heater to control the operating temperature. To improve their stability and repeatability, the gas sensors were aged at 300 ºC for 10 h in air. Here, the sensing properties of the sensors were measured by a NS-4003 series gas-sensing measurement system (China Zhong-Ke Micro-nano IOT, Internet of Things, Ltd.). The relative humidity (RH) is about 45%. The response and recovery times were defined as the time required for a change of the resistance to reach 90 % of the equilibrium value after injecting and that for removing the detected gas, respectively. When air and ppm-level target gas were flowed through the sensor

element, the corresponding steady-state resistances of the sensor in air (R_{air}) and in the air–gas mixture (R_{gas}) were recorded, respectively. The sensor gas response for oxidizing gas (NO) is defined as the ratio of R_{gas}/R_{air}, while the response for reducing gas (H_2S, H_2, CO or CH_4) is defined as the ratio of R_{air}/R_{gas}.

References

1 J. W. Deng, J. M. Ma, L. Mei, Y. J. Tang, Y. J. Chen, T. Lv, Z. Xu and T. H. Wang, *J. Mater. Chem. A,* **2013***, 1,* 12400-12403.

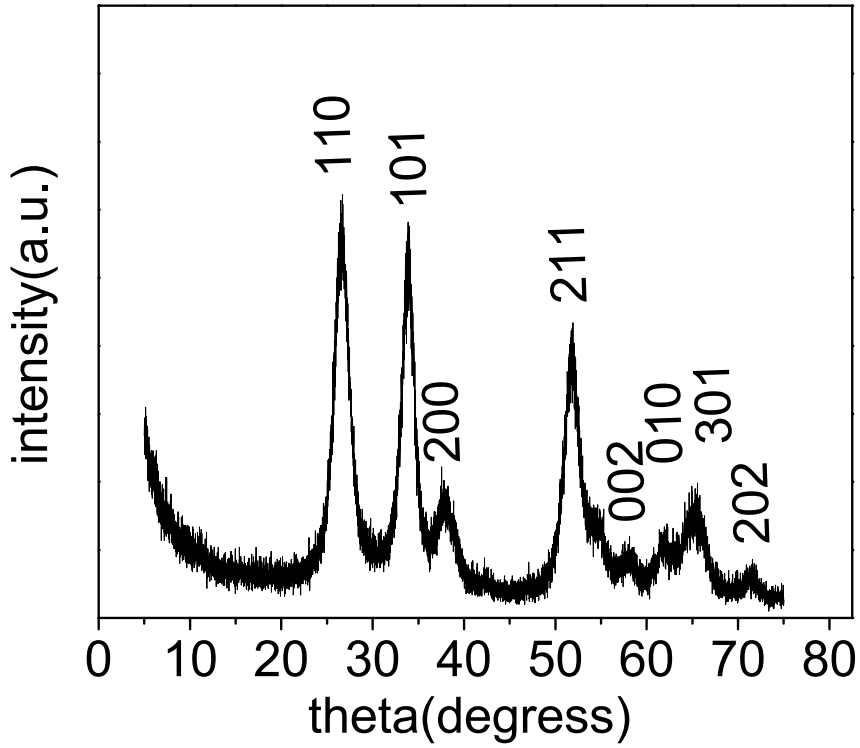

Fig. S1 XRD pattern of the as-synthesized SnO_2 synthesized without any additive.

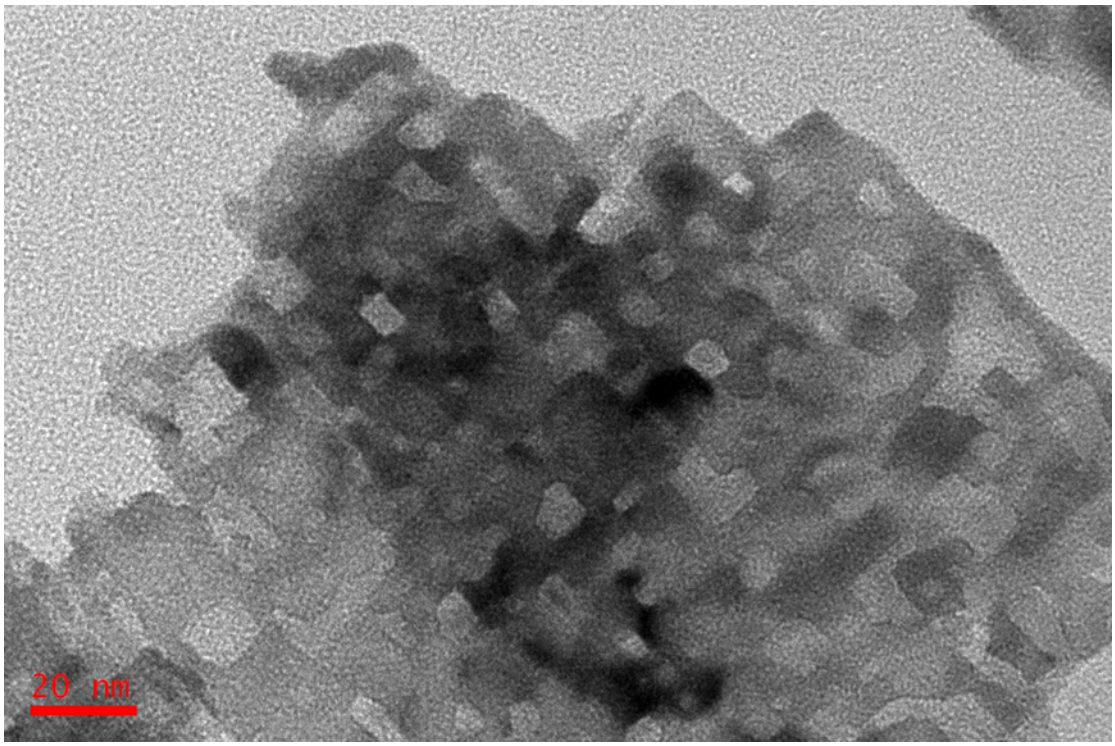

Fig. S2 TEM image of the SnO_2 sample synthesized without any additive.

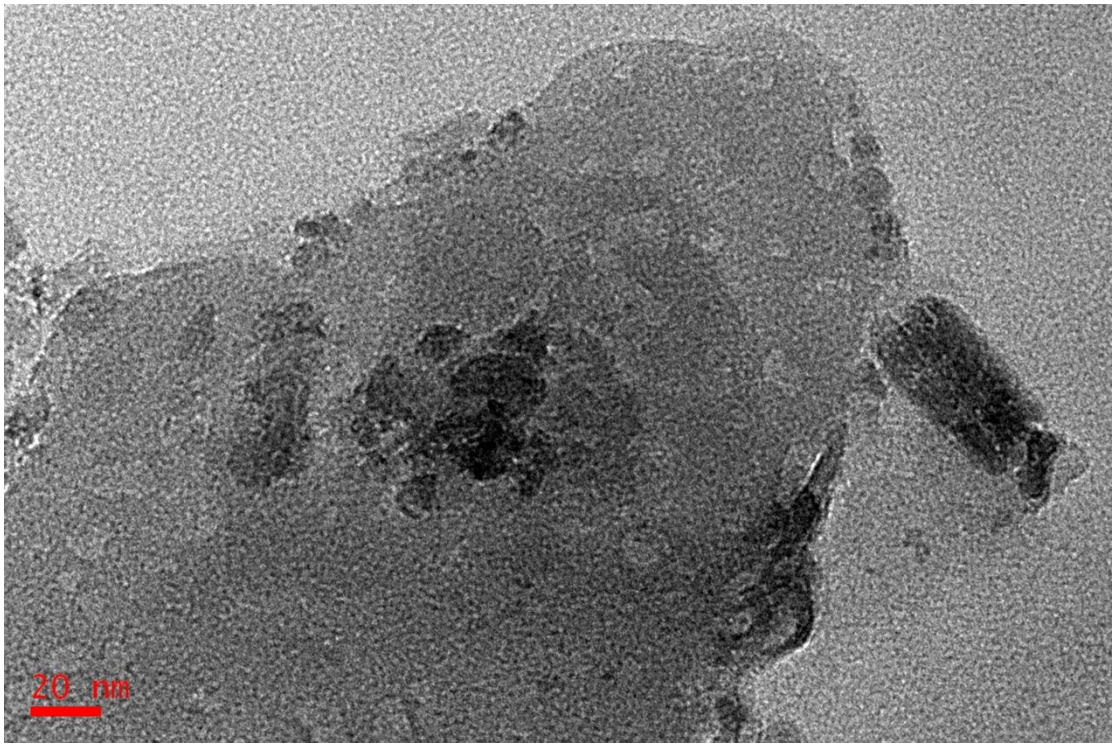

Fig. S3 TEM images of the SnO_2 samples synthesized with 5 mmol of biurea.

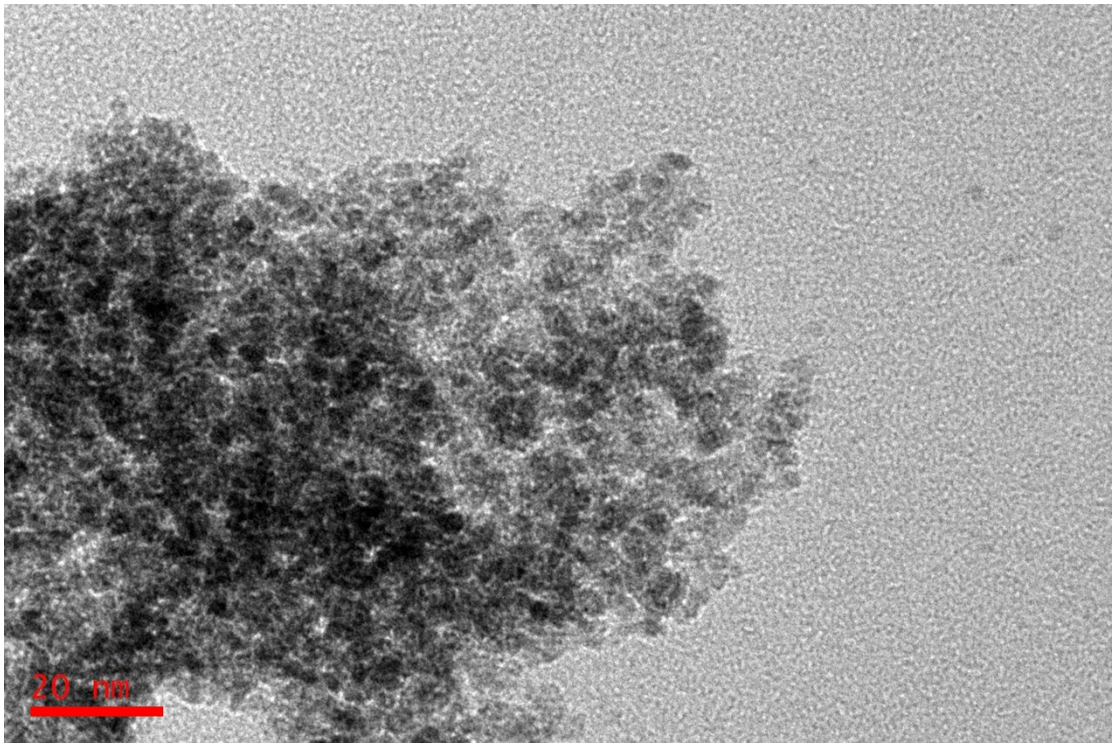

Fig. S4 TEM images of the different SnO_2 samples synthesized with 20 mmol of biurea.

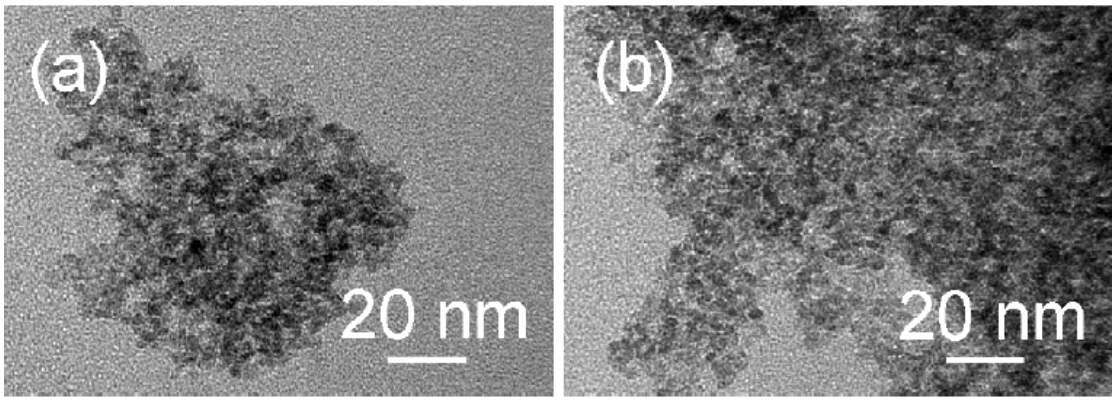

Fig. S5 TEM images of the SnO_2 sample synthesized with 15 mmol of urea.

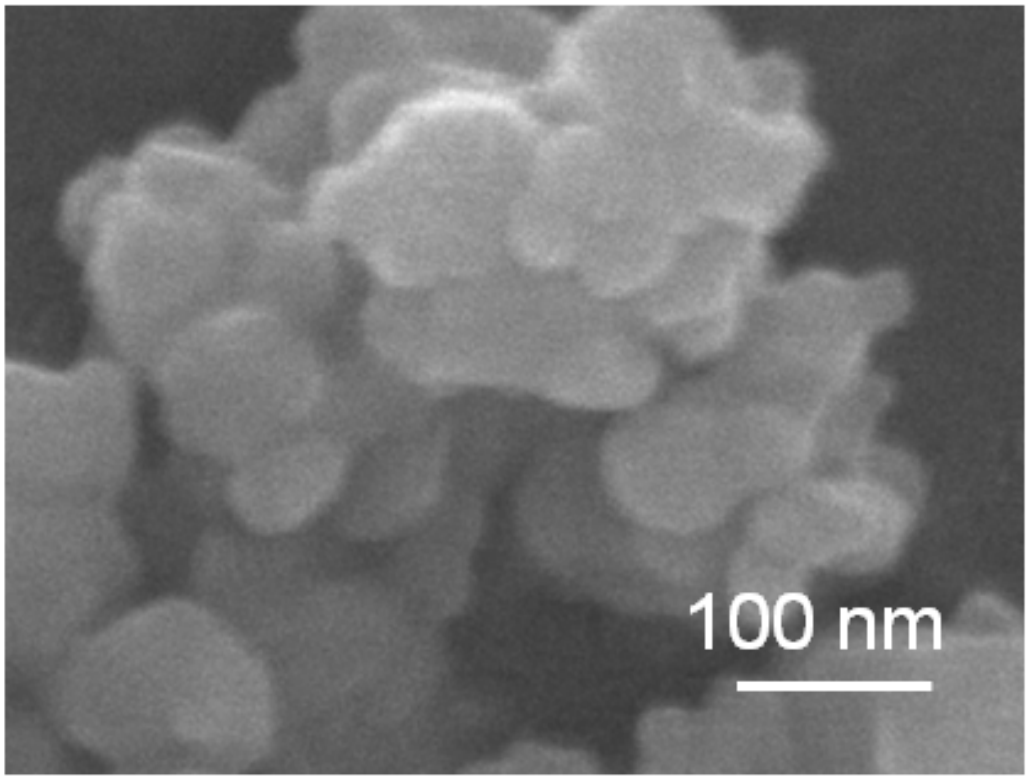

Fig. S6 SEM image of the commercial SnO_2.

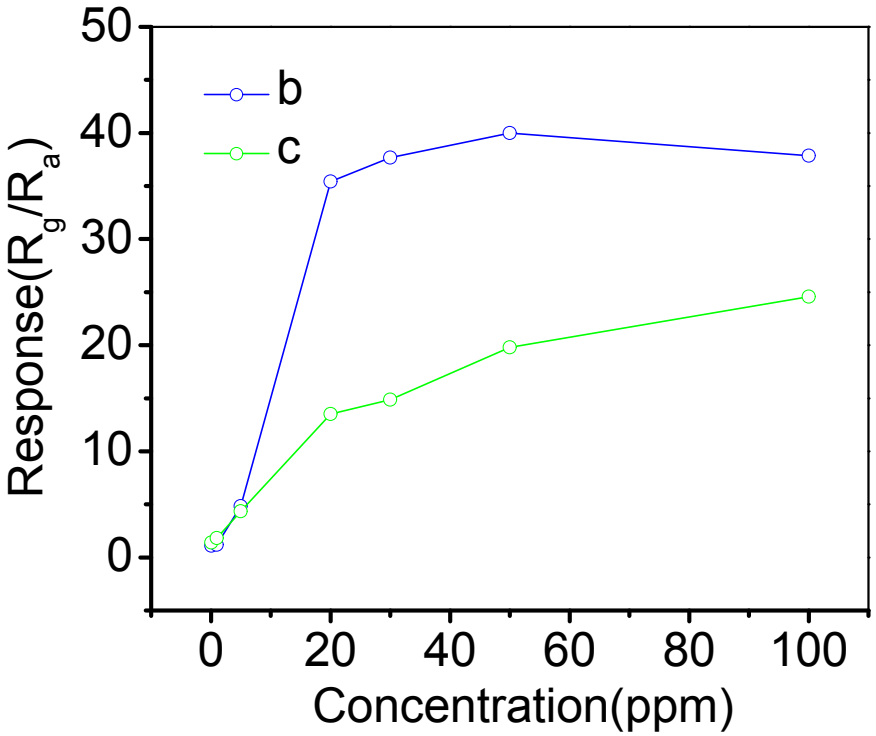

Fig. S7 Enlarged Figure for Fig. 3 (b: the as-synthesized SnO_2 without any additive; c: the commercial SnO_2).

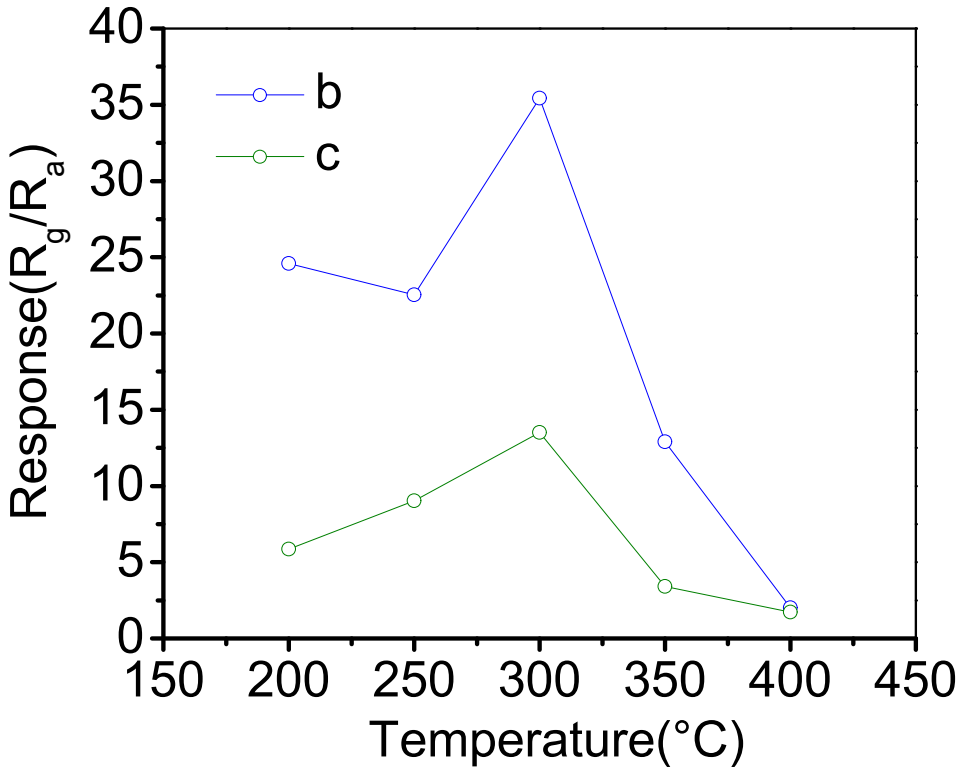

Fig. S8 Enlarged Figure for Figure 4b (b: the as-synthesized SnO_2 without any additive; c: the commercial SnO_2).