Electronic Supplementary Information

Construction of core-shell Fe_2O_3@SnO_2 nanohybrids for gas sensors by a simple flame-assisted spray process

Yunfeng Li, Yanjie Hu, Hao Jiang, Xiaoyu Hou and Chunzhong Li**

Key Laboratory for Ultrafine Materials of Ministry of Education, School of Materials Science and Engineering, East China University of Science & Technology, Shanghai 200237, China

*To whom correspondence should be addressed.

E-mail: czli@ecust.edu.cn (Prof. C. Z. Li) and huyanjie@ecust.edu.cn (Dr. Y. J. Hu)

Fax: +86 21 64250624; Tel: 86- 21- 6425- 0949;

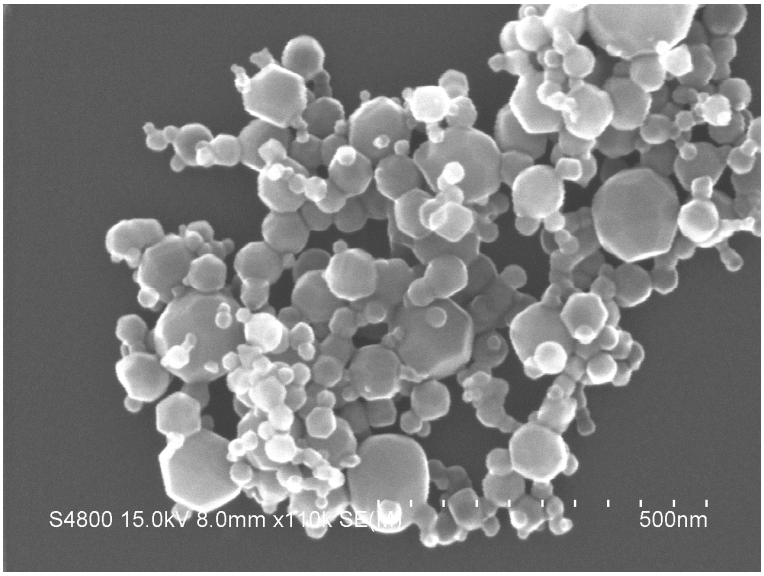

Fig.S1 SEM image of flame sprayed pure Fe_2O_3 particles without the encapsulation of SnO_2.

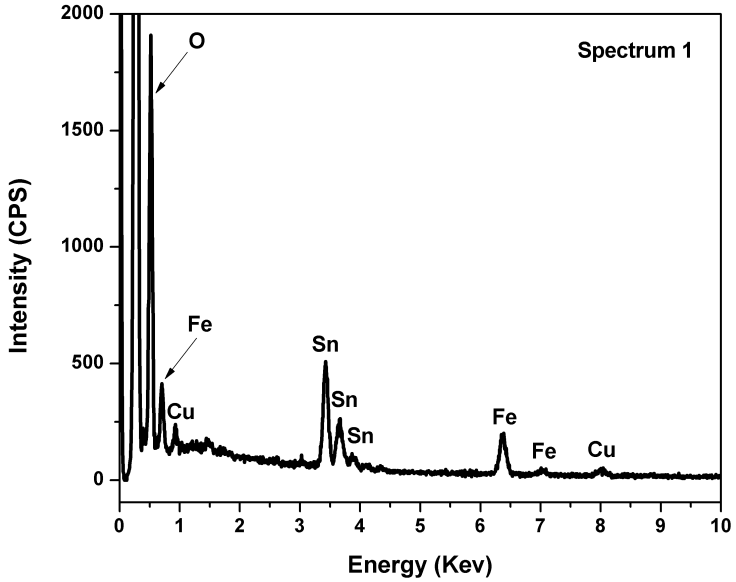

Fig.S2 EDS of flame sprayed Fe_2O_3@SnO_2 NHs.

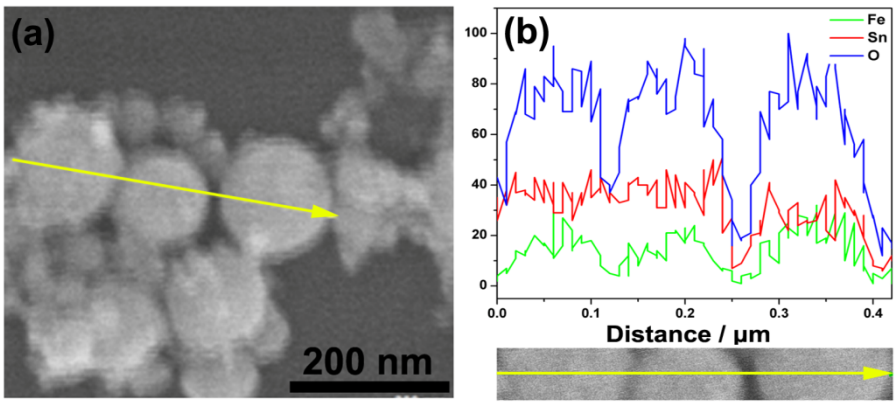

Fig.S3 (a) SEM image and (b) the corresponding EDS line scanning results of core-shell Fe_2O_3@SnO_2 particles. (As shown in Fig.S3b, it is noted that the distribution of Sn atoms is relatively uniform along the marked yellow arrow. The Fe atoms show a high-level content in the centre of particles. These results demonstrate that the core is composed of Fe_2O_3 component and the shell is assembled by SnO_2.)

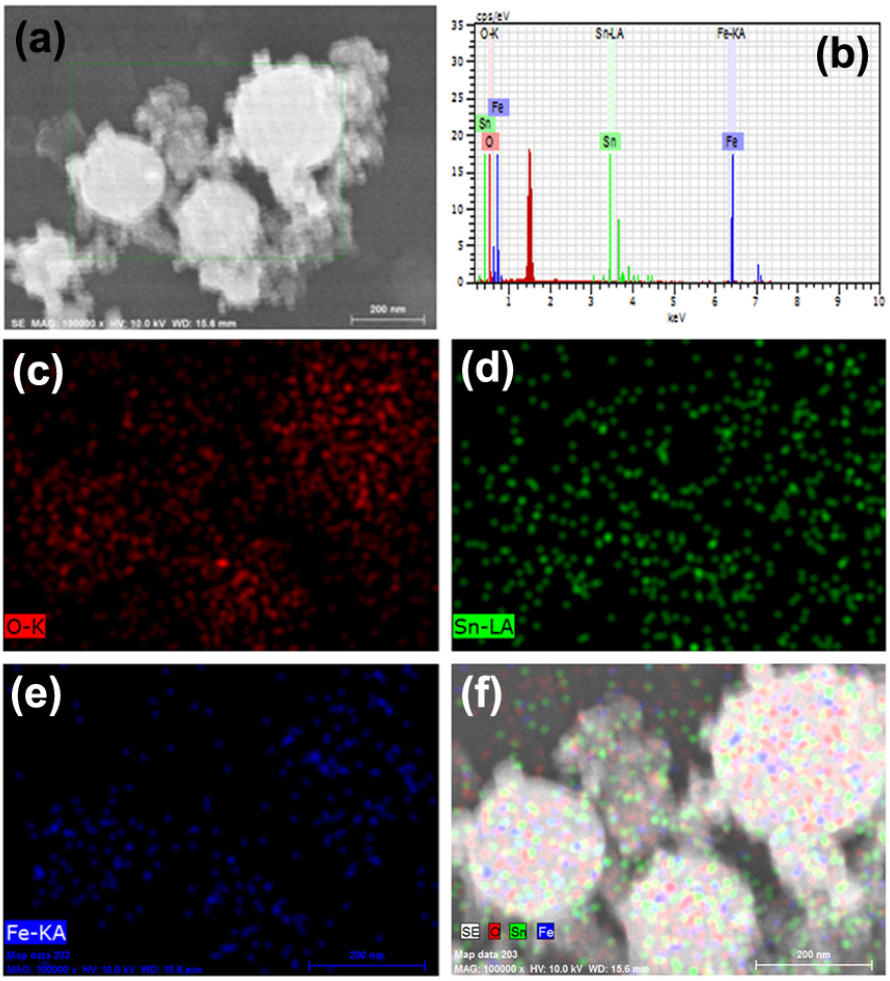

Fig.S4 (a) SEM image, (b) the corresponding EDS and (c-f) elemental mapping images of core-shell Fe_2O_3@SnO_2 particles. (Fig.S4 shows the elements mapping distribution of more particles in a single SEM image in detail. Obviously, it is found that Fe atoms are mainly in central of particles, compared to Sn atoms. The mapping results clearly demonstrate that the obtained Fe_2O_3/SnO_2 NHs have typical core-shell structures.)

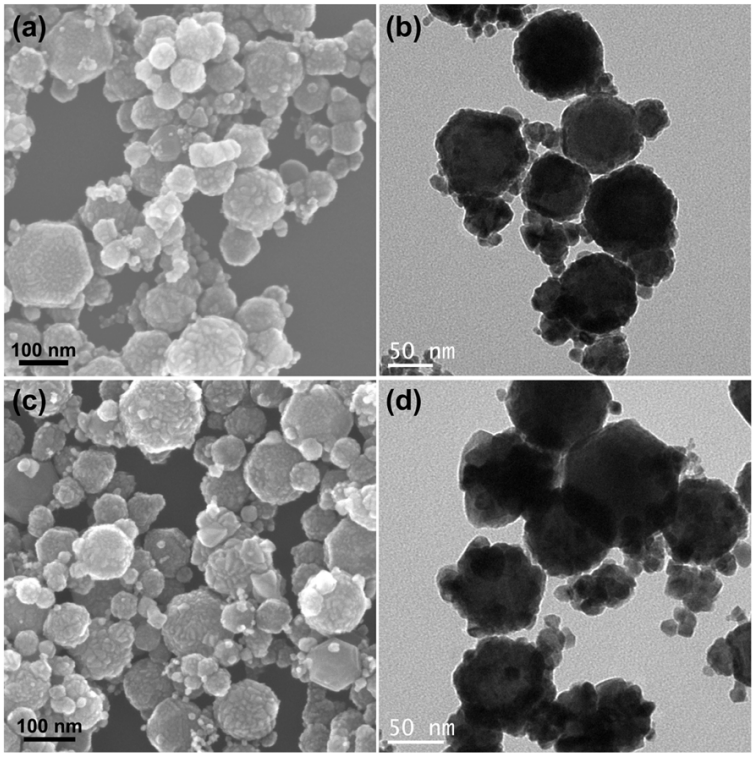

Fig.S5 SEM and TEM images of core-shell Fe_2O_3@SnO_2 NHs: (a, b) bubbler temperature at 15 °C; (c, d) 45°C

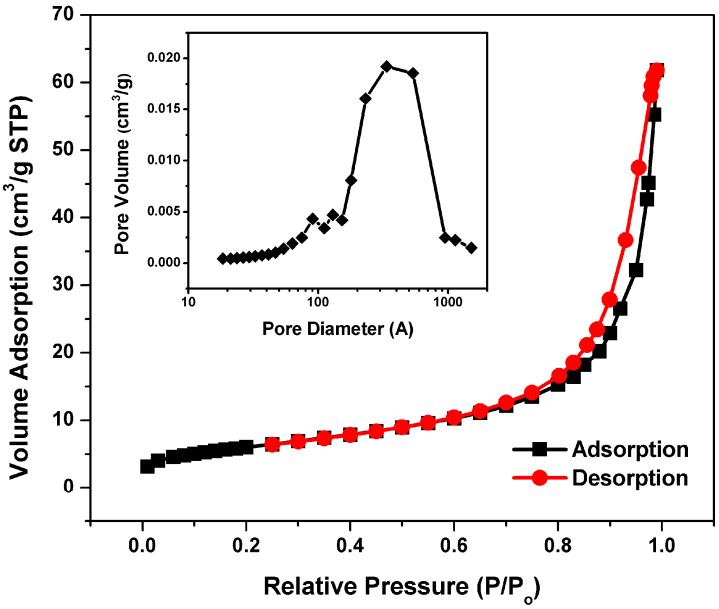

Fig.S6 Nitrogen adsorption and desorption isotherm and the corresponding pore-size distribution curve (inset) of Fe_2O_3@SnO_2 NHs.

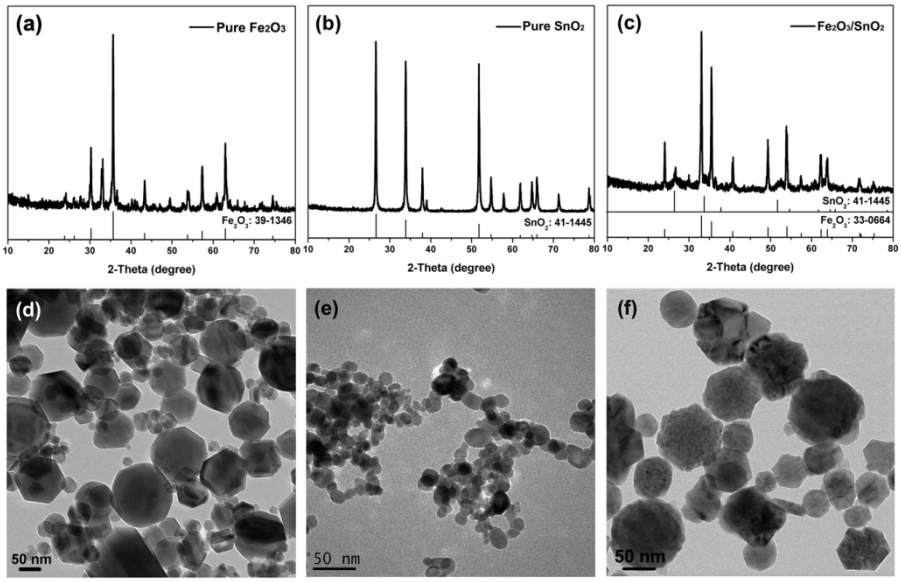

Fig. S7 XRD patterns and corresponding TEM images of flame made (a, d) pure Fe_2O_3, (b, e) pure SnO_2 and (c, f) co-oxidation Fe_2O_3/SnO_2 NPs.

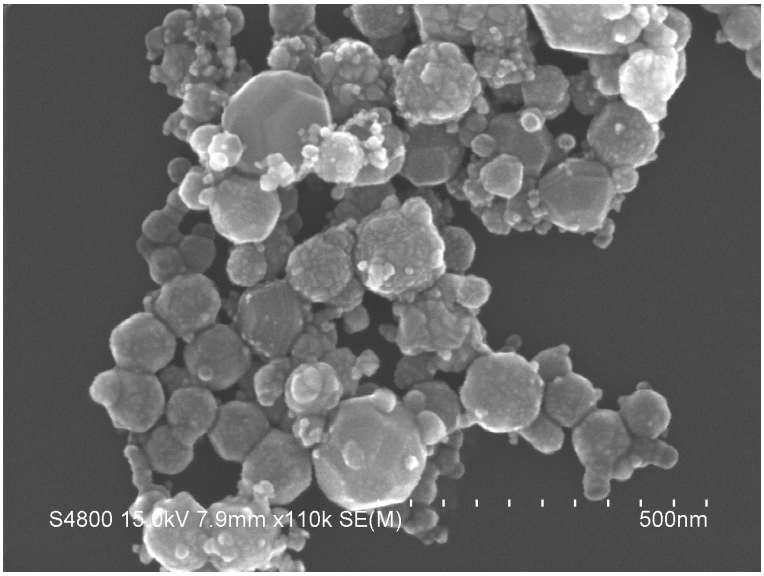

Fig.S8 SEM image of flame co-oxidation Fe_2O_3/SnO_2 nanoparticles.

Tab.S1 Specific surface area and gas-sensing performance of the obtained samples

Flame sprayed powders	**BET surface area (m^2/g)**	**Sensitivity[b] (R_a/R_g)**	**Response time (s)**	**Recovery time (s)**
Fe_2O_3	14.8	6.5	10	18
Fe_2O_3@SnO_2 (15)	17.3	16.9	13	17
Fe_2O_3@SnO_2 (30)[a]	21.9	22.8	14	12
Fe_2O_3@SnO_2 (45)	19.5	19.6	11	16
Fe_2O_3/SnO_2	11.8	4.6	29	19
SnO_2	96.6	11.7	17	14

Fe_2O_3@SnO_2 (30)[a]: the core-shell NHs was prepared by FASP route with N_2 carrying the $SnCl_4$ vapor at 30 °C; Sensitivity[b] measured at 300 °C with response to 100 ppm ethanol.