Electronic Supplementary Material (ESI) for Inorganic Chemistry Frontiers.

Construction of PdO-decorated double-shell $ZnSnO_3$ hollow microspheres for n-propanol detection at low temperature

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The n-propanol gas was derived by a static liquid-gas method.[1,2] The relationship between the volume of n-propanol solution and the concentration of n-propanol gas could be calculated by the following formula:

$$C=[(22.4\times d\times \rho\times V_1)/(M\times V_2)]\times 1000$$

Where C (ppm) is the target gas concentration, d is the purity of n-propanol solution, ρ (g/mL) is the density of n-propanol solution, V_1 (μL) is the injection volume of n-propanol solution, V_2 (L) is the volume of the glass chamber and M (g/mol) is the molecular weight of n-propanol solution. The n-propanol solution is purchased from Aladdin Chemistry Co. Ltd. (Shanghai, China).

References

[1] L. Li, P. F. Cheng, Y. L. Wang, L. P. Xu, B. Zhang, C. Lv, J. Ma, Y. Zhang, Sb-doped three-dimensional $ZnFe_2O_4$ macroporous spheres for N-butanol chemiresistive gas sensors, Sensors. Actuators B: Chem., 2020, **320**, 128384.

[2] P. Sun, W. N. Wang, Y. P. Liu, Y. F. Sun, J. Ma, G. Y. Lu, Hydrothermal synthesis of 3D urchin-like α-Fe_2O_3 nanostructure for gas sensor, Sensors. Actuators B: Chem., 2012, **173**, 52-57.

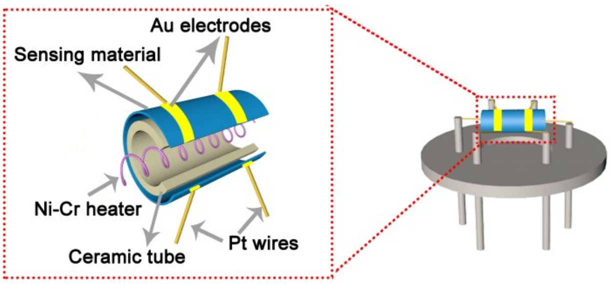

Fig. S1. Schematic structure of the overall gas sensor.

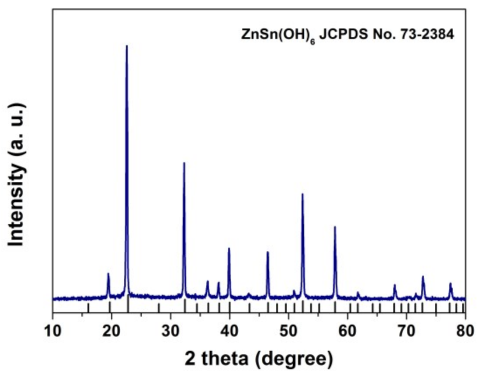

Fig. S2. The XRD pattern of $ZnSn(OH)_6$ precursor.

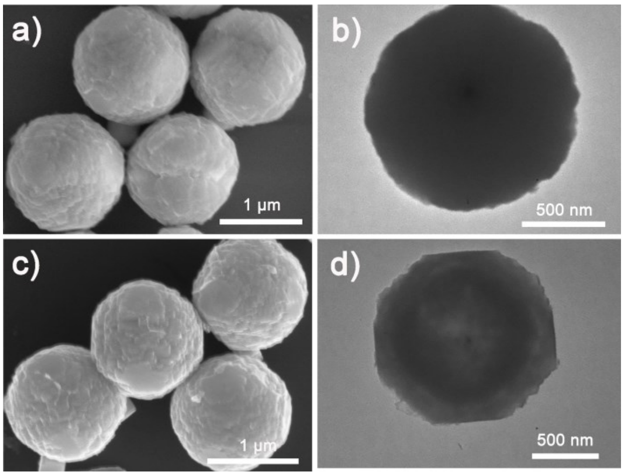

Fig. S3. The FESEM images of (a) $ZnSn(OH)_6$ precursor and (c) $ZnSnO_3$; the TEM images of (b) $ZnSn(OH)_6$ precursor and (d) $ZnSnO_3$.

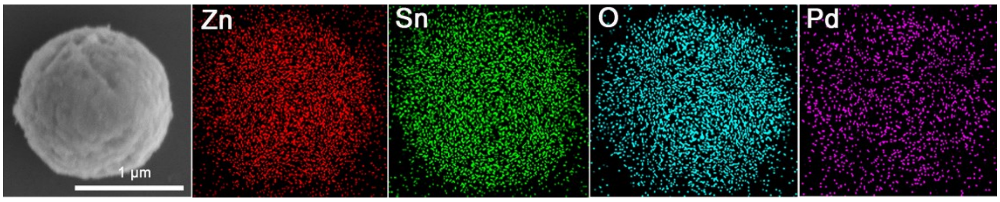

Fig. S4. The elemental mapping image of 4 wt% PdO-loaded $ZnSnO_3$ samples.

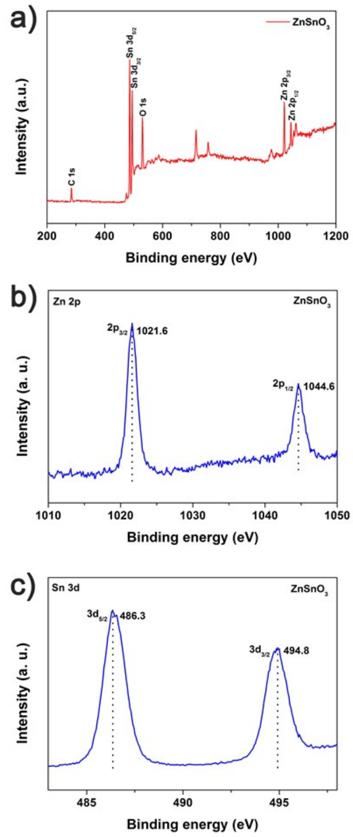

Fig. S5. The XPS spectrum of pure $ZnSnO_3$: (a) overall spectrum; (b) Zn 2p and (c) Sn 3d.

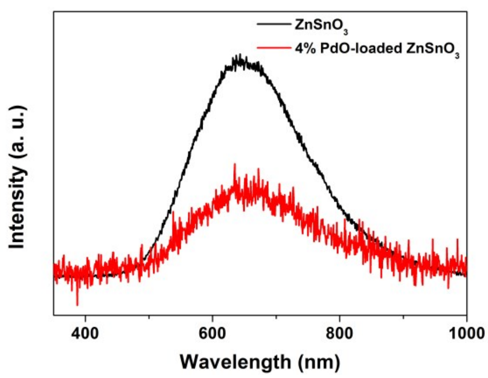

Fig. S6. The room-temperature PL spectrum of pure $ZnSnO_3$ and 4 wt% PdO-loaded $ZnSnO_3$ samples.

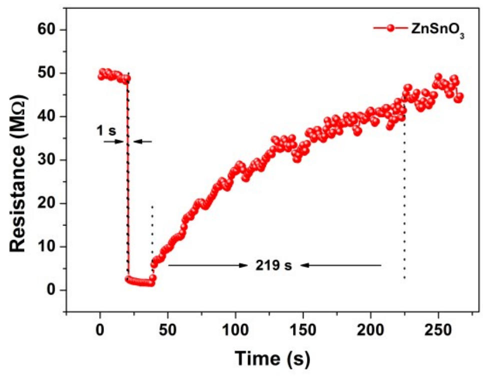

Fig. S7. The response/recovery speed of pure $ZnSnO_3$ to 100 ppm n-propanol at 200^{o}C.

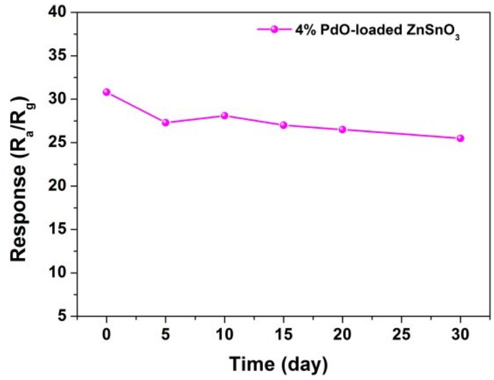

Fig. S8. The long-term stability of the sensor based on 4 wt% PdO-loaded $ZnSnO_3$ to 100 ppm n-propanol at 140^{o}C.