Electronic Supplementary Information (ESI) for RSC Advances.

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Enhanced formaldehyde sensing properties of SnO_2 nanorods coupled with Zn_2SnO_4

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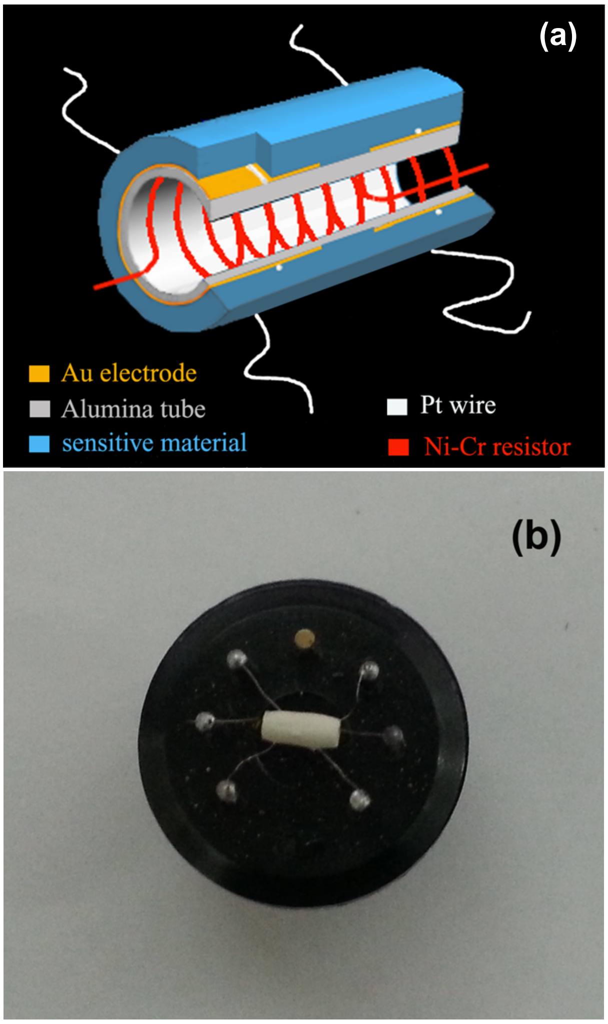


Figure S1.

(a) Sketch of the structure of a typical SnO_2-Zn_2SnO_4 nanocomposites gas sensor;

(b) Photograph of the gas sensor.

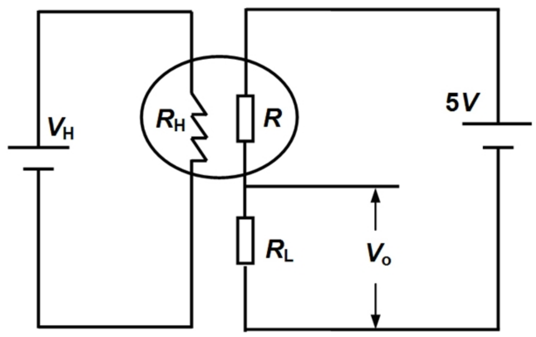


Figure S2. Schematic diagram of testing principle for SnO_2-Zn_2SnO_4 nanocomposites gas sensors. V_H is heating voltage and R_H is heating resistance.

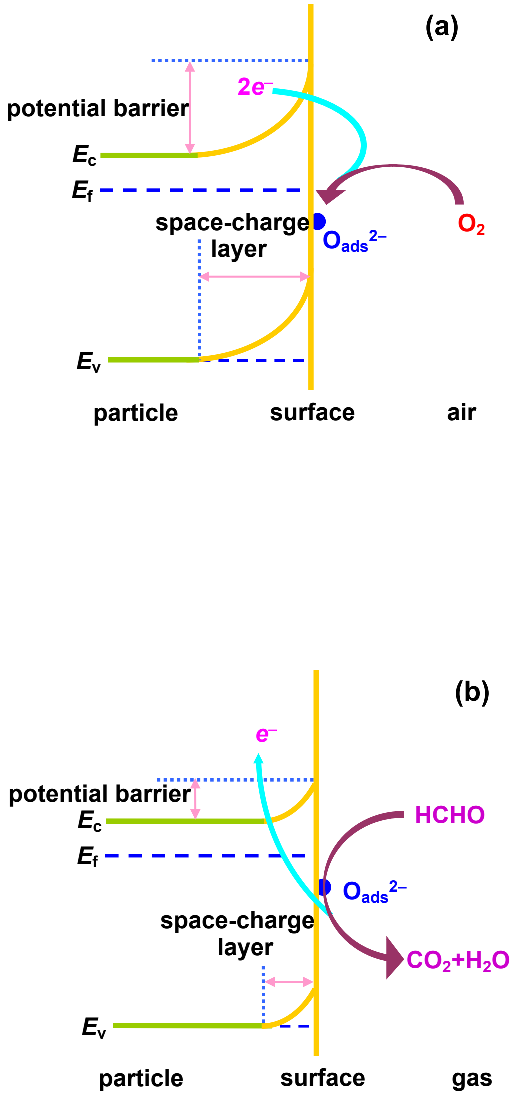
According to Figure S2, the electrical resistance of sensor can be obtained as following:

$$R = \frac{5 - V_o}{V_o} \cdot R_L$$

where R is the resistance of the sensor, R_L is a constant load resistance unchanged with the surrounding gas partial pressure, V_o is the sensor export voltage. The gas response β was defined as the ratio of the electrical resistance in air (R_o) to that in gases (R_g):

$$R_o = \frac{5 - (V_o)_{air}}{(V_o)_{air}} \cdot R_L , \qquad R_g = \frac{5 - (V_o)_g}{(V_o)_g} \cdot R_L , \qquad \beta = \frac{R_o}{R_g}$$

where $(V_o)_{air}$ is the export voltage in air, and $(V_o)_{gas}$ is in gases.



Scheme S3.

A schematic diagram of the proposed reaction mechanism of SnO_2-Zn_2SnO_4 nanocomposites based sensor to formaldehyde. (a) in air, (b) in formaldehyde.

Table S1 The lattice constants and average grain size of SnO_2 and $SnZn_x$ composites.

Samples	SnO_2		Zn_2SnO_4	Average grain size[§] (nm)
	a (Å)	*c* (Å)	*a* (Å)	
SnO_2	4.740	3.184	–	36.4
$SnZn_5$	4.745	3.186	–	34.2
$SnZn_{15}$	4.758	3.191	8.618	16.2
$SnZn_{25}$	4.759	3.193	8.610	10.7
$SnZn_{35}$	4.765	3.197	8.607	9.2
$SnZn_{45}$	4.767	3.201	8.601	11.1

SnO_2 The average lattice constant was calculated from (110), (101), (200), (111), (211), and (220) reflections. JCPDS 41-1445, System: Tetragonal, Lattice: Body-centered, Space group: *P42/mnm*(136) , *a*= 4.738 Å, *c*=3.187 Å.

Zn_2SnO_4 The average lattice constant was calculated from (311) and (440) reflections. JCPDS 24-1470, System: Cubic, Space group: $Fd\bar{3}m$(227), *a*= 8.657 Å.

§ The crystallite size *D* is deduced from the (101) peak width using Scherrer's equation.