Electronic Supplementary Information

High sensitive and selective formaldehyde gas sensor using molecular imprinting technique based on Ag-$LaFeO_3$

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Sensitivity testing:

The export voltage of the sensor was measured by using a conventional circuit (Fig. S1f) in which the element was connected with an external resistor in series at a circuit voltage of 5 V. According to Figure 1f, the electrical resistance of sensor can be obtained as follows:

$$R=\frac{5\text{-}V_0}{V_0}\cdot R_{\mathrm{L}}, \qquad (1)$$

where R is the resistance of the sensor, R_L is the constant load resistance unchanged with the surrounding gas partial pressure, and V_0 is the sensor export voltage. For p-type semiconductor, the gas response (β) was defined as the ratio of the electrical resistance in gas (R_g) to that in air (R_a):

$$R_{\mathrm{g}}=\frac{5-(V_0)_{\mathrm{gas}}}{(V_0)_{\mathrm{gas}}}\cdot R_{\mathrm{L}}, \qquad (2)$$

$$R_{\mathrm{a}}=\frac{5-(V_0)_{\mathrm{air}}}{(V_0)_{\mathrm{air}}}\cdot R_{\mathrm{L}}, \qquad (3)$$

$$\beta=\frac{R_{\mathrm{g}}}{R_{\mathrm{a}}}, \qquad (4)$$

where $(V_0)_{air}$ is the export voltage in air, and $(V_0)_{gas}$ is in gases. The gas sensing properties were examined in a chamber though which air or a sample gases were allowed to flow at a rate of 160 $cm^3\ min^{-1}$. The electrical response of the Ag-$LaFeO_3$ sensor was measured with an automatic test system, controlled by a personal computer (Fig. S1e).

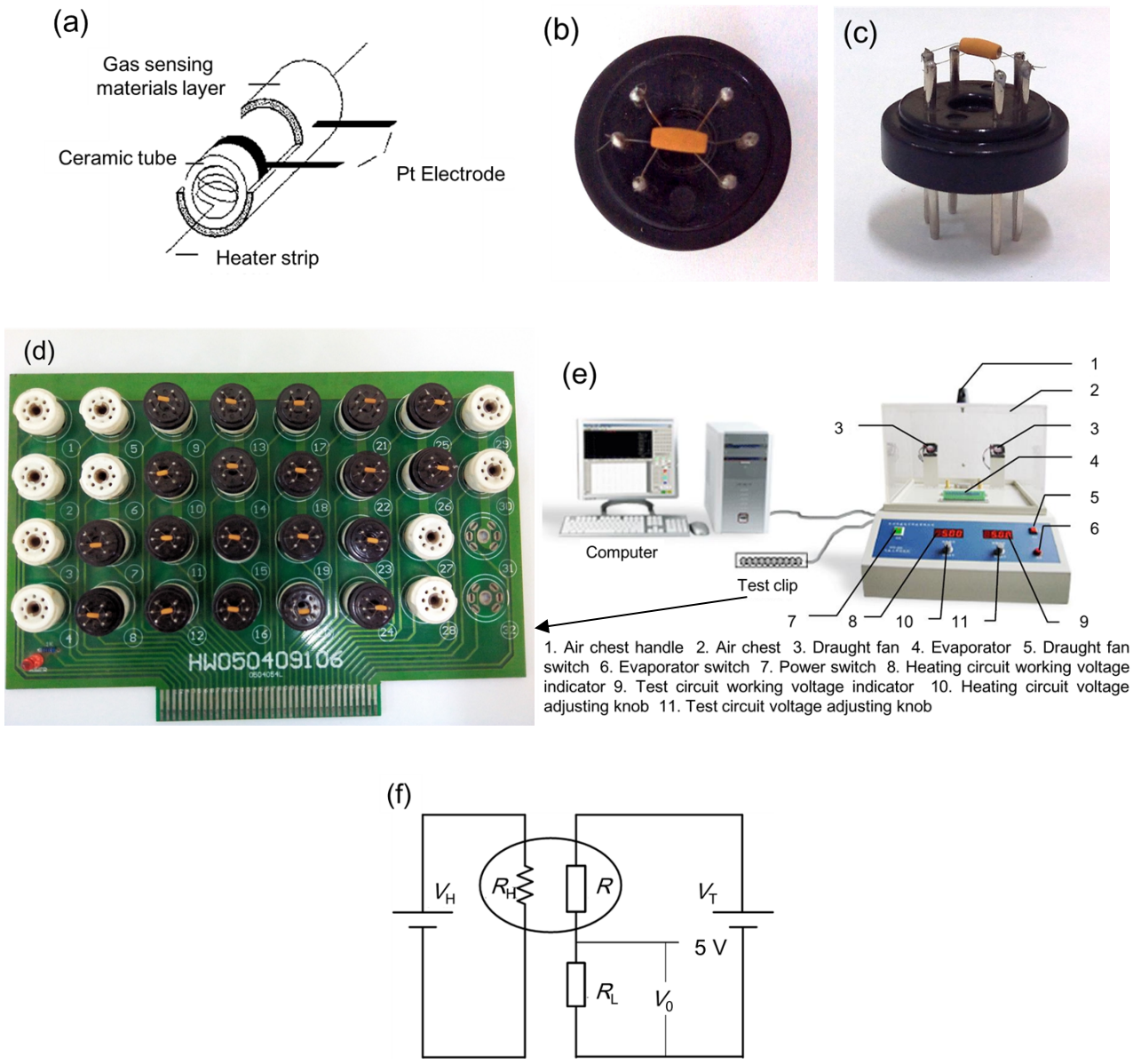

Fig. S1 a) Structure of ceramic tube; b-c) Photographs of a sensing device, b) front view, c) side view; d) Test clip with multiple sensing devices; e) WS-30A gas senor tester; f) Schematic drawing of gas sensor testing circuit.

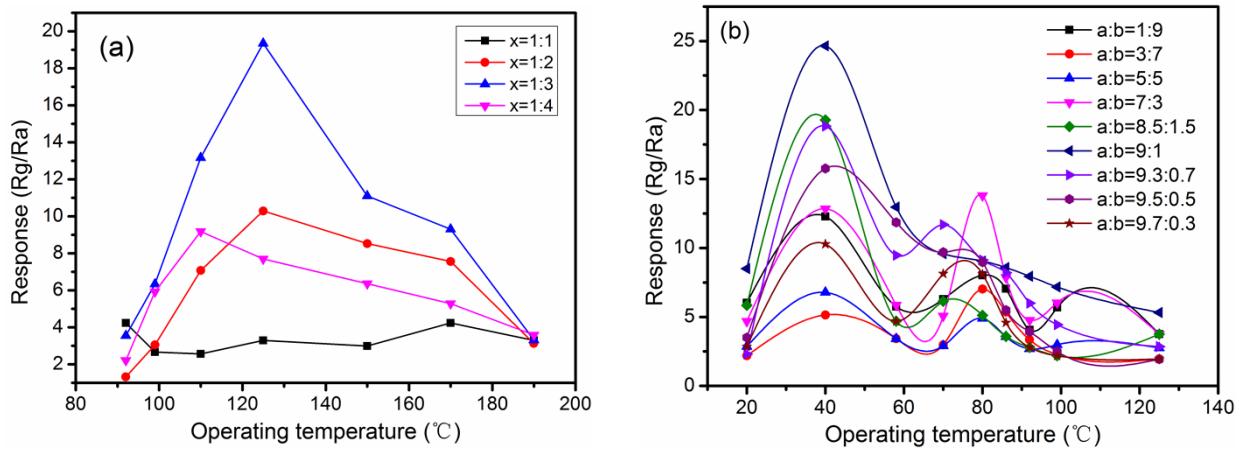

Fig. S2 Relationship between sensitivity and operating temperature of a) the MINs to 1 ppm formaldehyde gas and b) the compounds to 0.5 ppm formaldehyde gas.

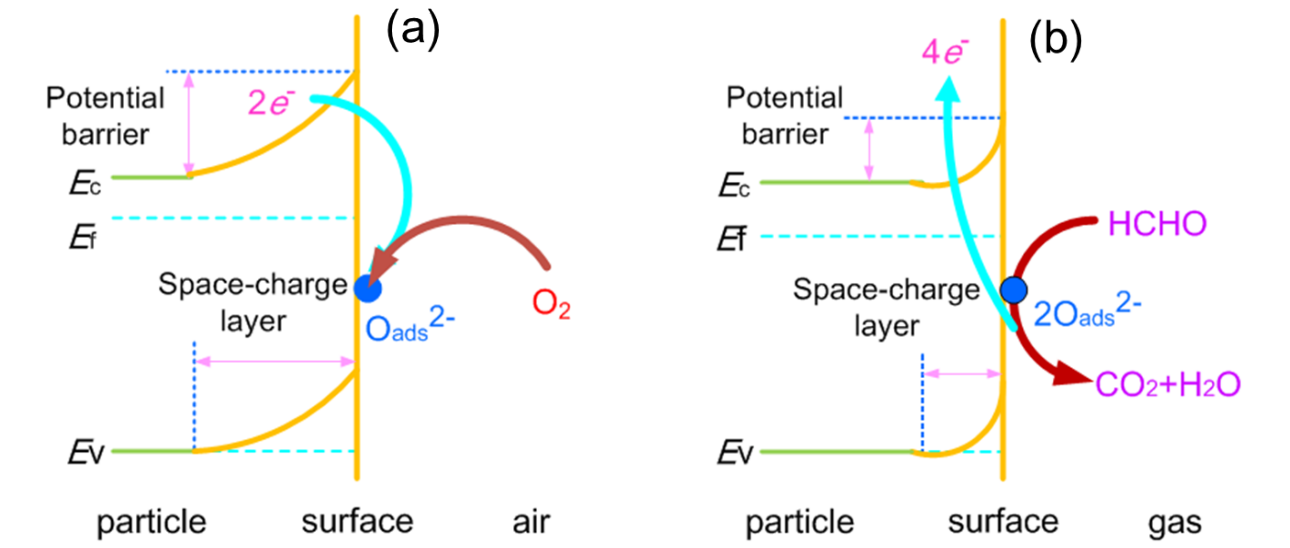

Fig. S3 A schematic diagram of the proposed reaction mechanism of sensors to formaldehyde: a) in air, b) in formaldehyde.

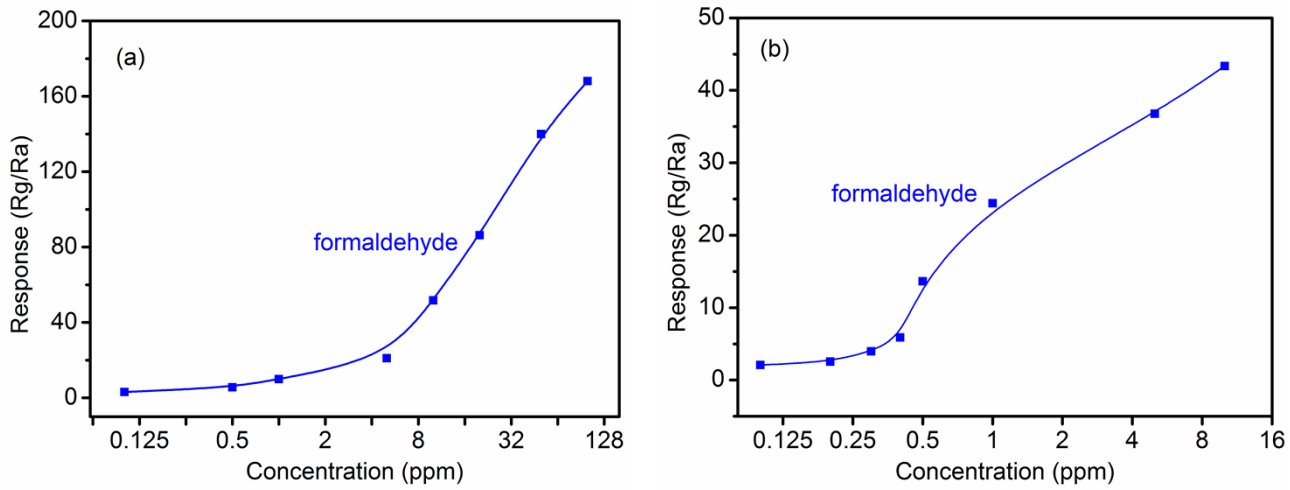

Fig. S4 Relationship of sensitivity and different concentration of formaldehyde, a) Sample-B and b) Sample-C.