Supplementary Materials for

Highly Sensitive Triethylamine Gas Sensor Enabled by Hamburger-like GO/ZnO Heterostructures

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For sensor fabrication, the as-prepared gas-sensitive material was mixed with deionized water and ground in an agate mortar to form a paste. The paste is then uniformly coated onto an alumina ceramic tube equipped with gold electrodes using a small brush until the tube is fully covered. The coated device is subsequently dried at 80°C for 30 minutes in a drying oven to form a layer of gas-sensitive film. Subsequently, the sensor is aged at 260°C for 72 hours to ensure stability.

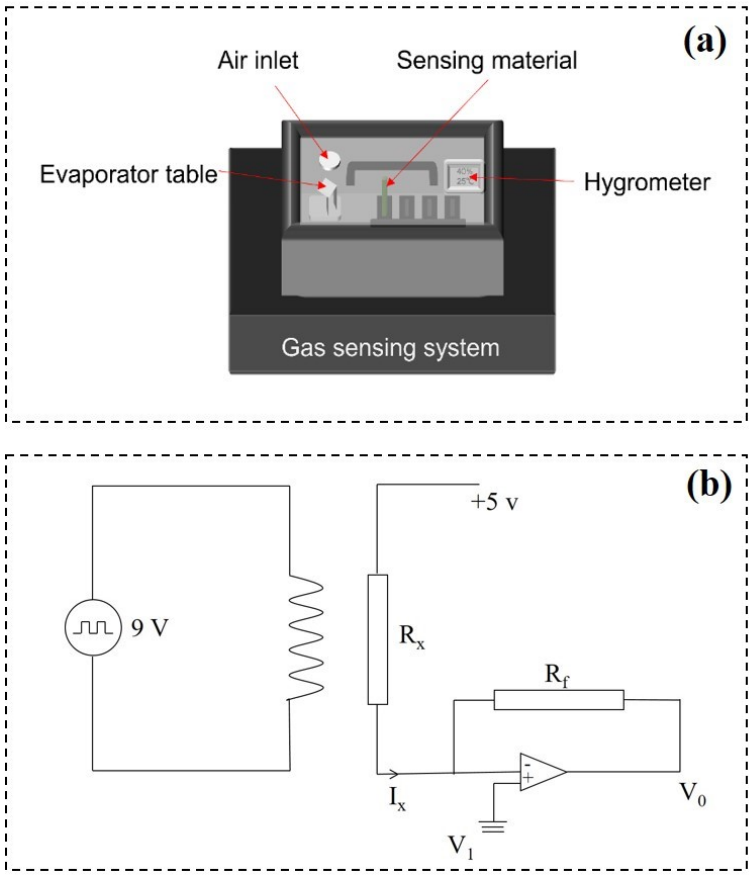

Fig. S1. (a) Schematic diagram of the gas-sensing system. (b) Schematic diagram of the gas sensing measurement circuit.

In the experimental configuration, as shown in Fig. S1, a 1600 mL sensing chamber is equipped with an evaporation table situated directly beneath the air inlet. Vapors of trimethylamine (TEA), acetone, ethanol, toluene, methanol, formaldehyde,

and ammonia are generated via liquid-phase evaporation. Taking TEA as an example, a micro-sampler is used to inject liquid TEA onto the evaporation table, which is maintained at 400°C. After evaporation stabilizes, the gas sensing response is monitored in real time. To proceed to the next test, the sensor must first be reset by opening the test chamber lid, allowing ambient air to flush the system and restore the sensor signal to its baseline level.

The sensor response (S) is defined as the ratio of resistance in air (R_a) to that in the target gas (R_g), i.e., $S = R_a/R_g$. The response time (τ_{res}) refers to the time required for the sensor to reach 90% of the total resistance change upon gas exposure, while the recovery time (τ_{rec}) denotes the time needed to recover 90% of the baseline resistance after gas removal. The volume of liquid reagent injected is determined using equation:

$$V_{\chi} = \frac{V \times C \times M}{22.4 \times 10^3 \times D \times P}$$

where V_x is the liquid injection volume (μL), V is the test chamber volume (L), C is the target vapor concentration (ppm), M is the molecular weight (g/mol), D is the liquid density (g/cm^3), P is the liquid purity.

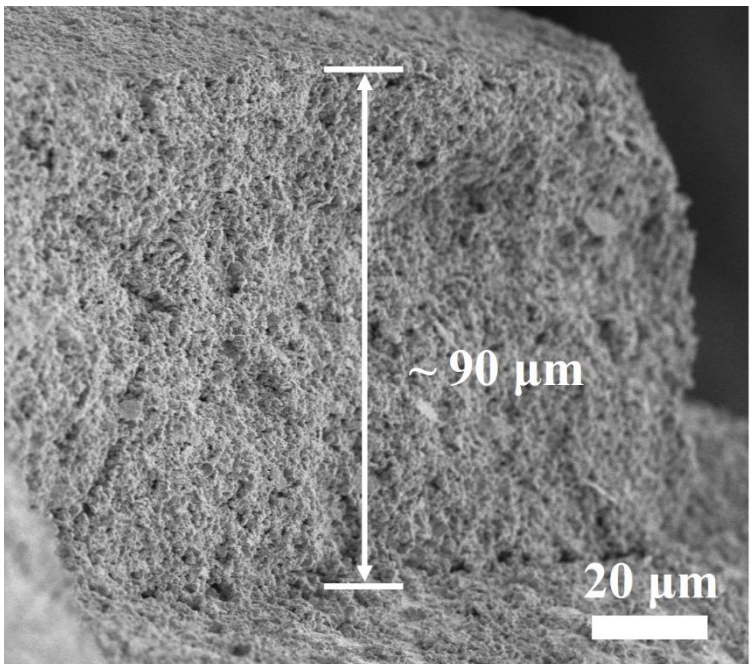

Fig. S2. The cross-sectional SEM image of the sensing film.

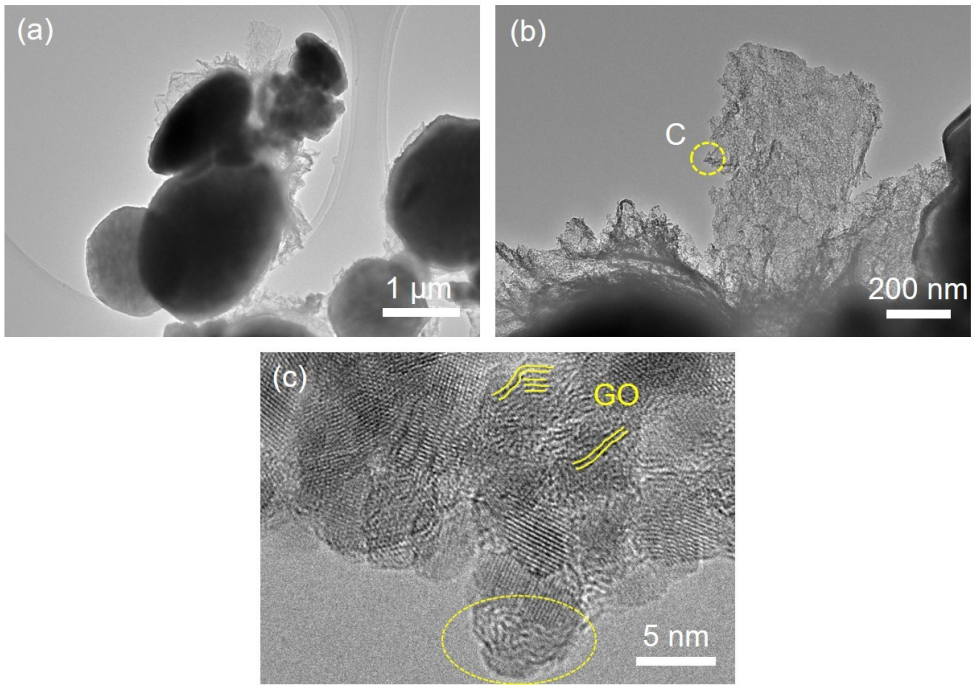

Fig. S3 (a-b) TEM images of the 50% GO/ZnO. (c) The corresponding HRTEM images of marked C position in (b).

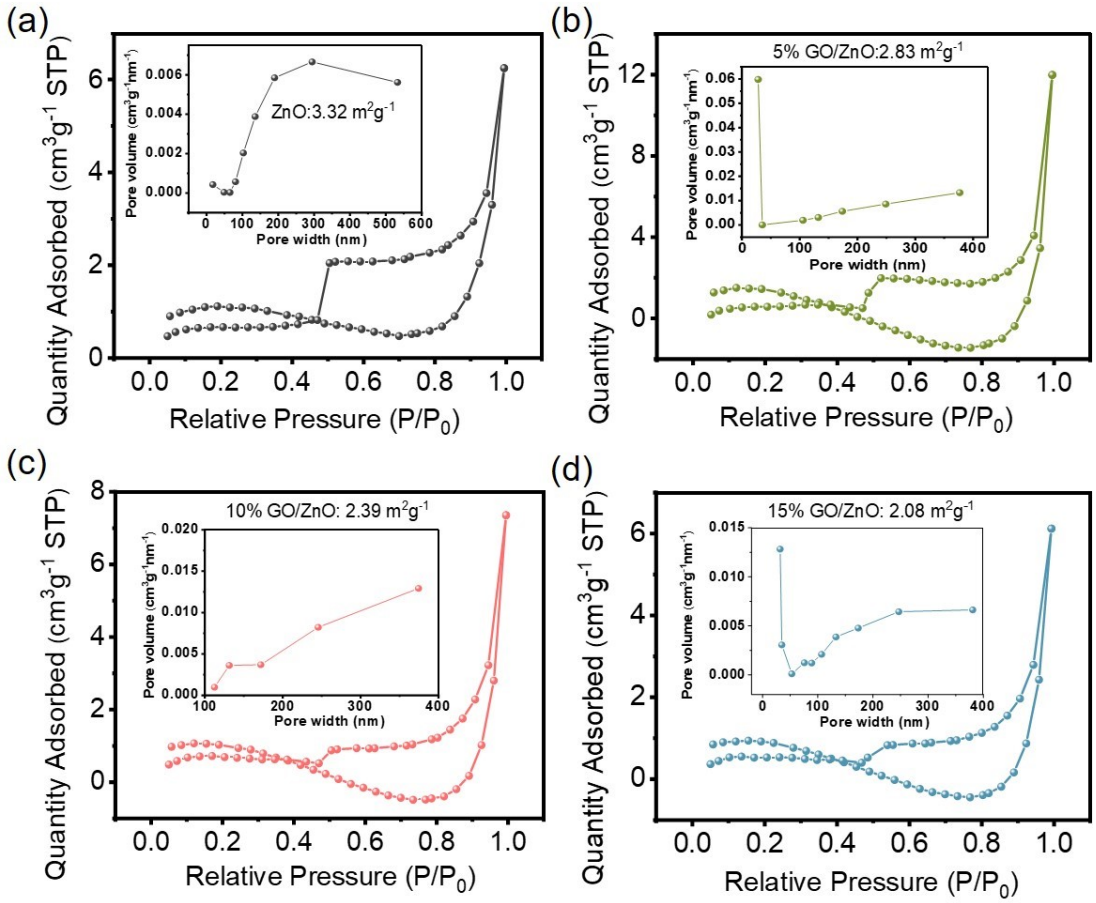

Fig. S4 BET analysis. N_2 adsorption-desorption isotherms of (a) ZnO, (b) 5% GO/ZnO, (c) 10% GO/ZnO and (d) 15% GO/ZnO with pore size distribution curves.

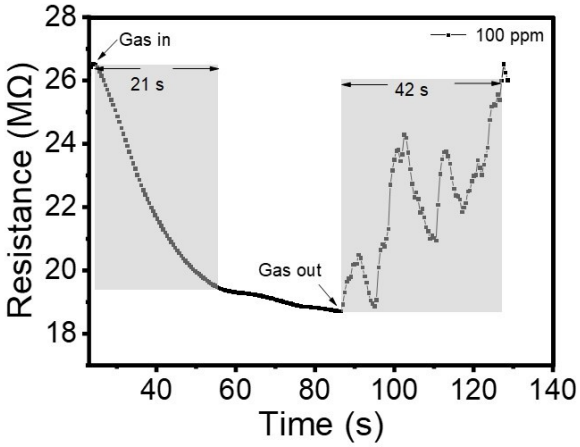

Fig. S5 Response and recovery times of pristine ZnO sensor.

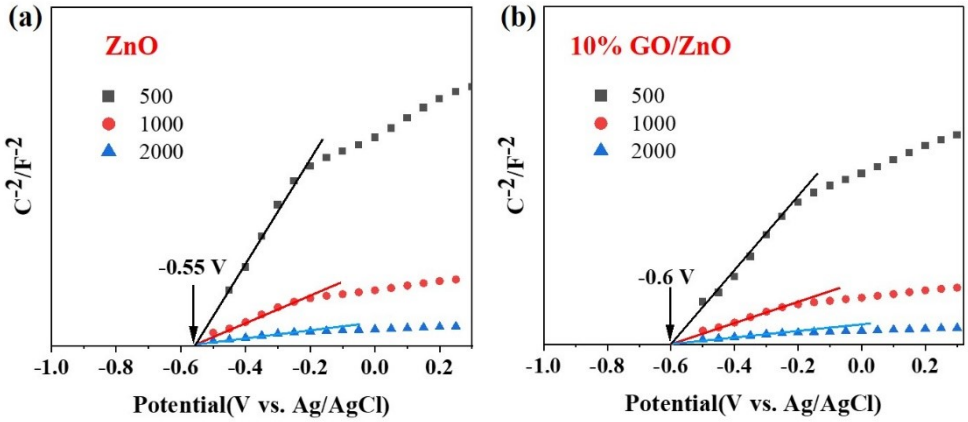

Fig. S6 Mott-Schottky plots of pristine ZnO and 10% GO/ZnO.

Table S1. XPS O 1S Acreage percentages of peaks of diverse oxygen sorts.

Atomic (%)	**O_L (%)**	**O_V (%)**	**O_C (%)**
ZnO	47.69	38.13	14.18
5% GO/ZnO	79.52	14.83	5.65
10% GO/ZnO	60.69	17.75	21.56
25% GO/ZnO	74	16.03	9.07

Table S2. Gas sensors based on SMOs gas-sensitive materials.

Material	TEA concentration	T	S	LOD	Refs
In_2O_3/ZnO	100 ppm	120℃	188.01	1 ppm	1
Nd_2O_3/ZnO	100 ppm	157℃	360.09	0.15 ppm	2
rGO/$InWO_4$	100 ppm	220℃	59.5	5 ppm	3
rGO/In_2O_3	100 ppm	200℃	172	0.5 ppm	4
ZnO/$SnWO_4$	200 ppm	160℃	118.63	5 ppm	5
GO/WS_2	100 ppm	100℃	3.88	/	6
ZnO/SnO_2	100 ppm	320℃	45.20	5 ppm	7
MoS_2/ZnO	100 ppm	200℃	23.57	1 ppm	8
MoS_2/ZnO	100 ppm	200℃	31.08	1 ppm	9
BiOBr/ZnO	100 ppm	200℃	20.57	1 ppm	10
ZnO/$Ti_3C_2T_x$	100 ppm	160℃	83.65	1 ppm	11
GO/ZnO	100 ppm	260℃	1230	0.5 ppm	This work

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