Supporting Information

Controlled Synthesis and Enhanced Gas Sensing Performance of Zinc-Doped Indium Oxide Nanowires

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5ppm ethanol.

Table S3 | Comparison with previous sensing studies on In_2O_3 nanostructures with different dopants for 5ppm acetone.

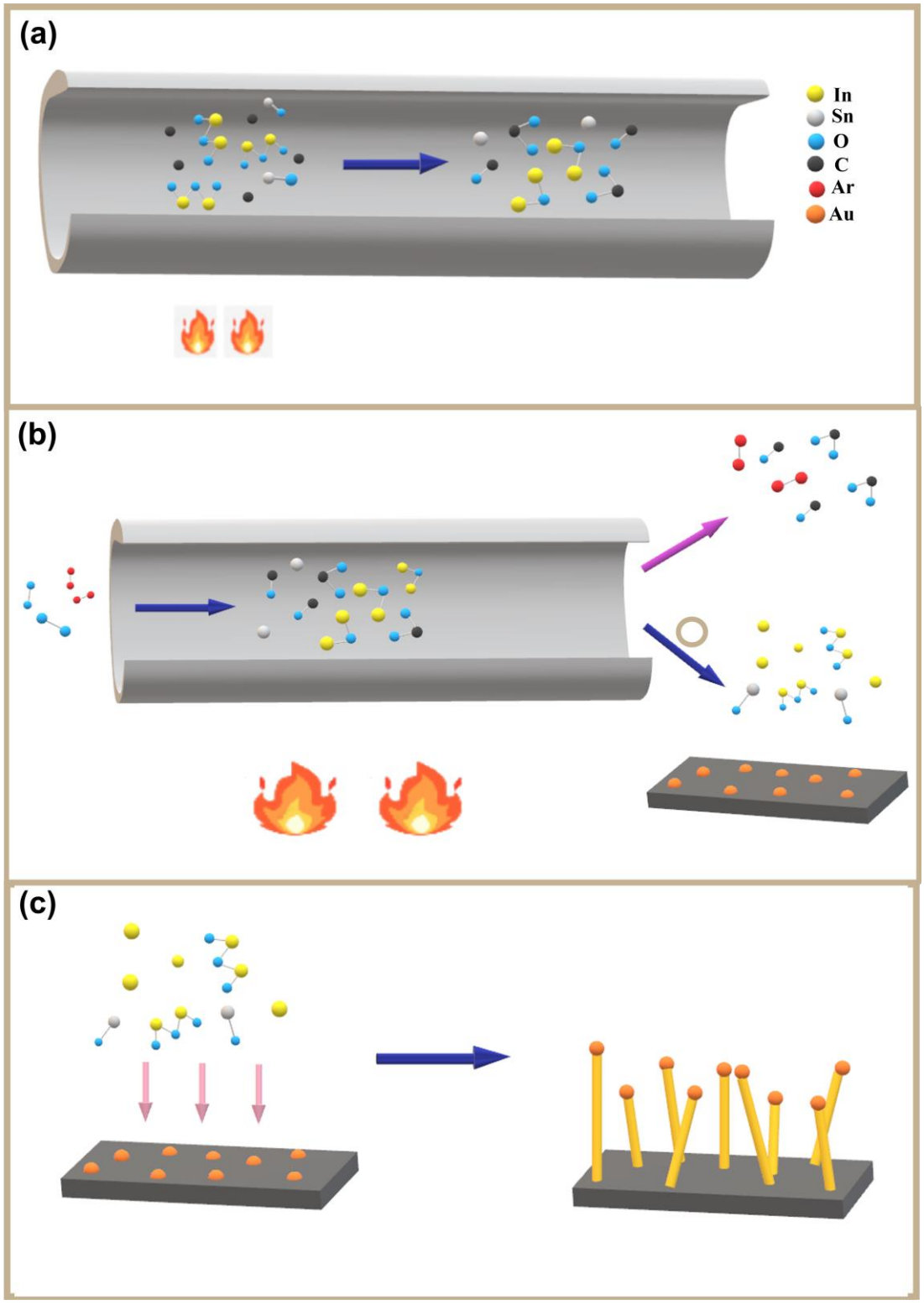

Figure S1 Schematic illustration of the growth mechanism of Zn-In_2O_3 nanowires. The reaction followed the VLS route(a)~(c).

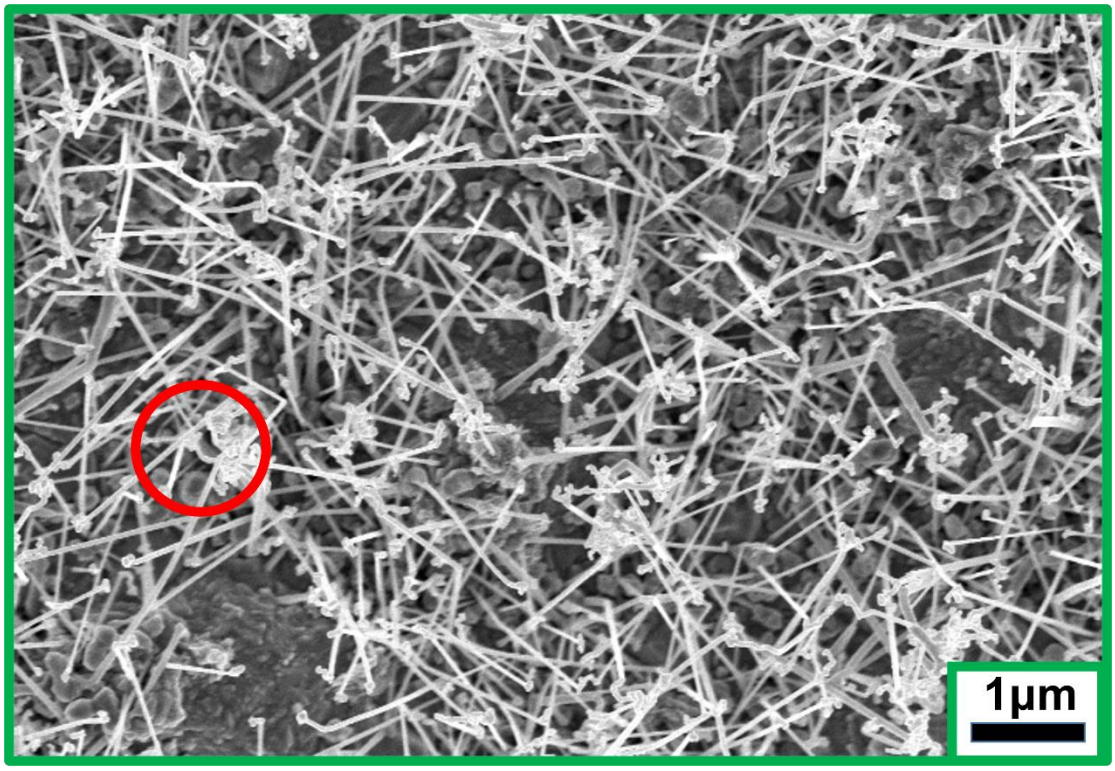

Figure S2 SEM image of zinc clusters on indium oxide nanowires.

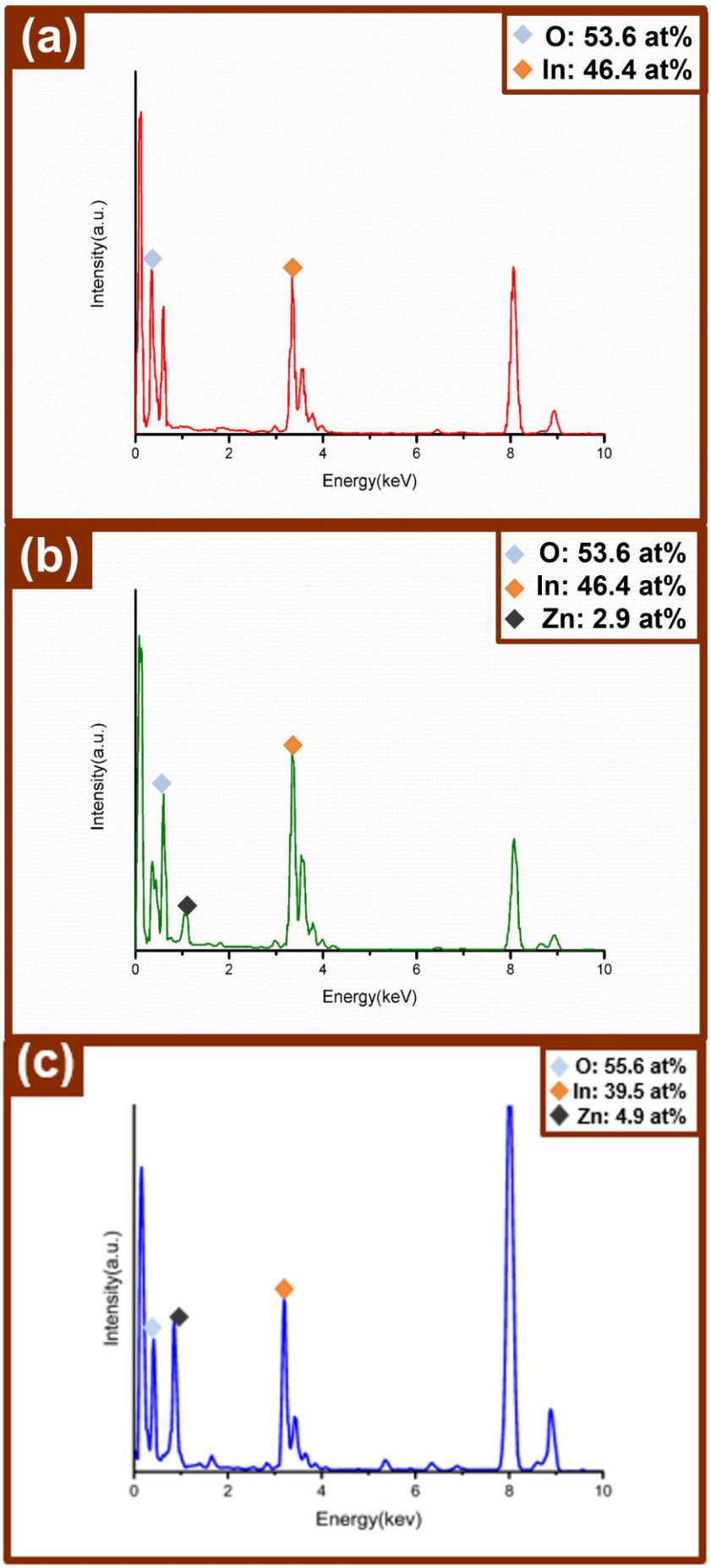
(a)
O: 53.6 at%
In: 46.4 at%
Intensity(a.u.)
0
2
4
6
8
10
Energy(keV)
(b)
O: 53.6 at%
In: 46.4 at%
Zn: 2.9 at%
Intensity(a.u.)
0
2
4
6
8
10
Energy(keV)
(c)
O: 55.6 at%
In: 39.5 at%
Zn: 4.9 at%
Intensity(a.u.)
0
2
4
6
8
10
Energy(kev)

Figure S3 Composition analysis of(a) In_2O_3 nanowire (b) 3 at% Zn-In_2O_3 nanowire (c) 5 at% Zn-In_2O_3 nanowire.

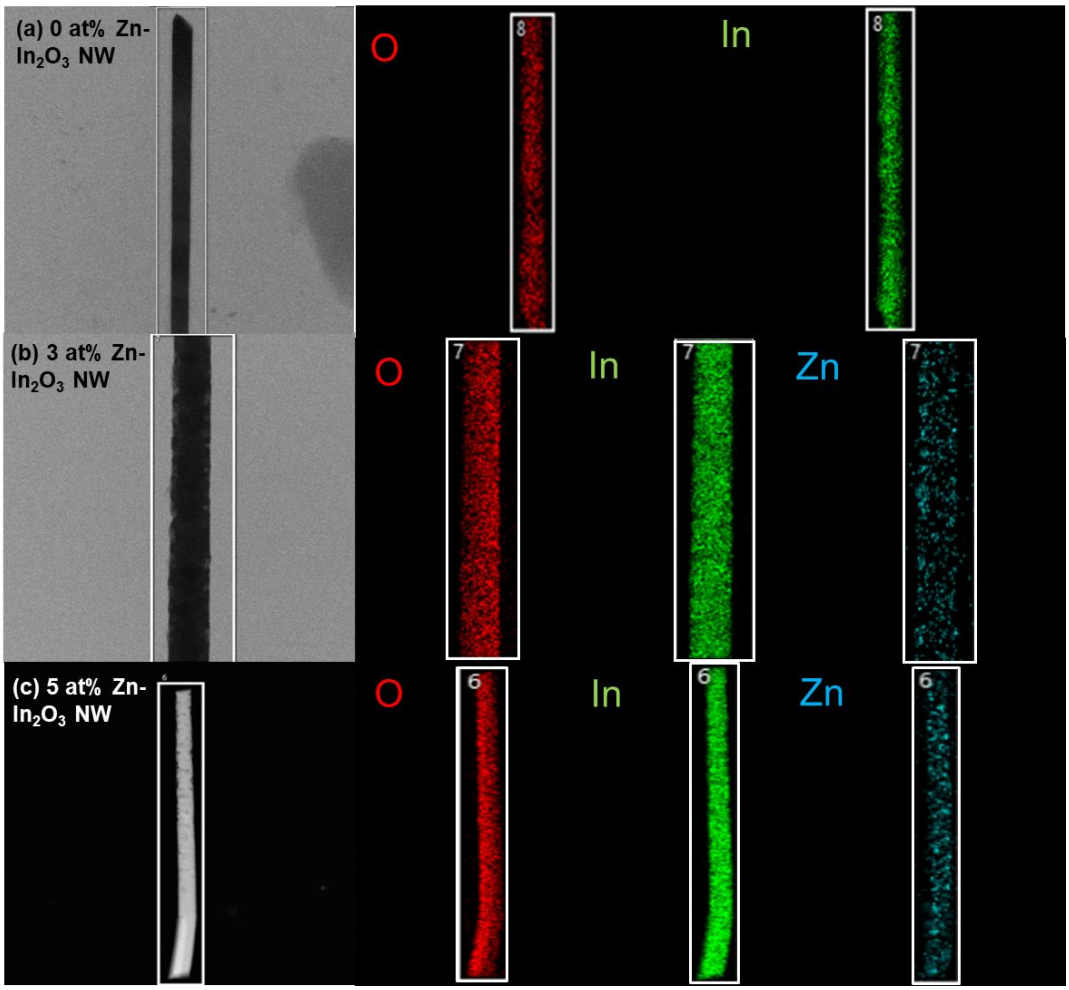

Figure S4 The mapping images of(a) In_2O_3 nanowire (b) 3 at% Zn-In_2O_3 nanowire (c) 5 at% Zn-In_2O_3 nanowire.

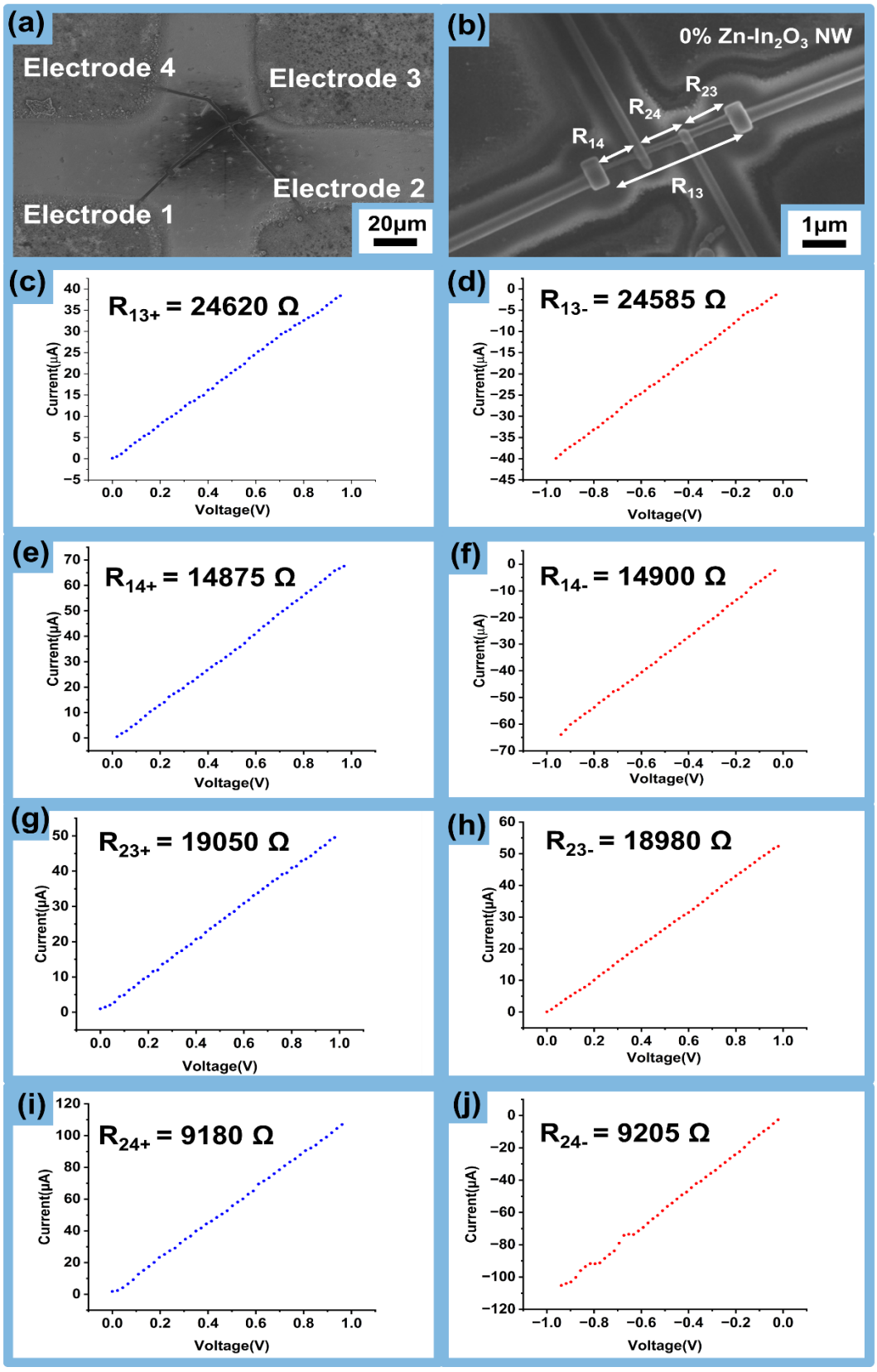

Figure S5. (a,b) SEM images of single In_2O_3 nanowire-based electrical measurement micro-device. I-V measurements of single In_2O_3 nanowire. (c) R_{13+} (d) R_{13-} (e) R_{14+} (f) R_{14-} (g) R_{23+} (h) R_{23-} (i) R_{24+} (j) R_{24-}.

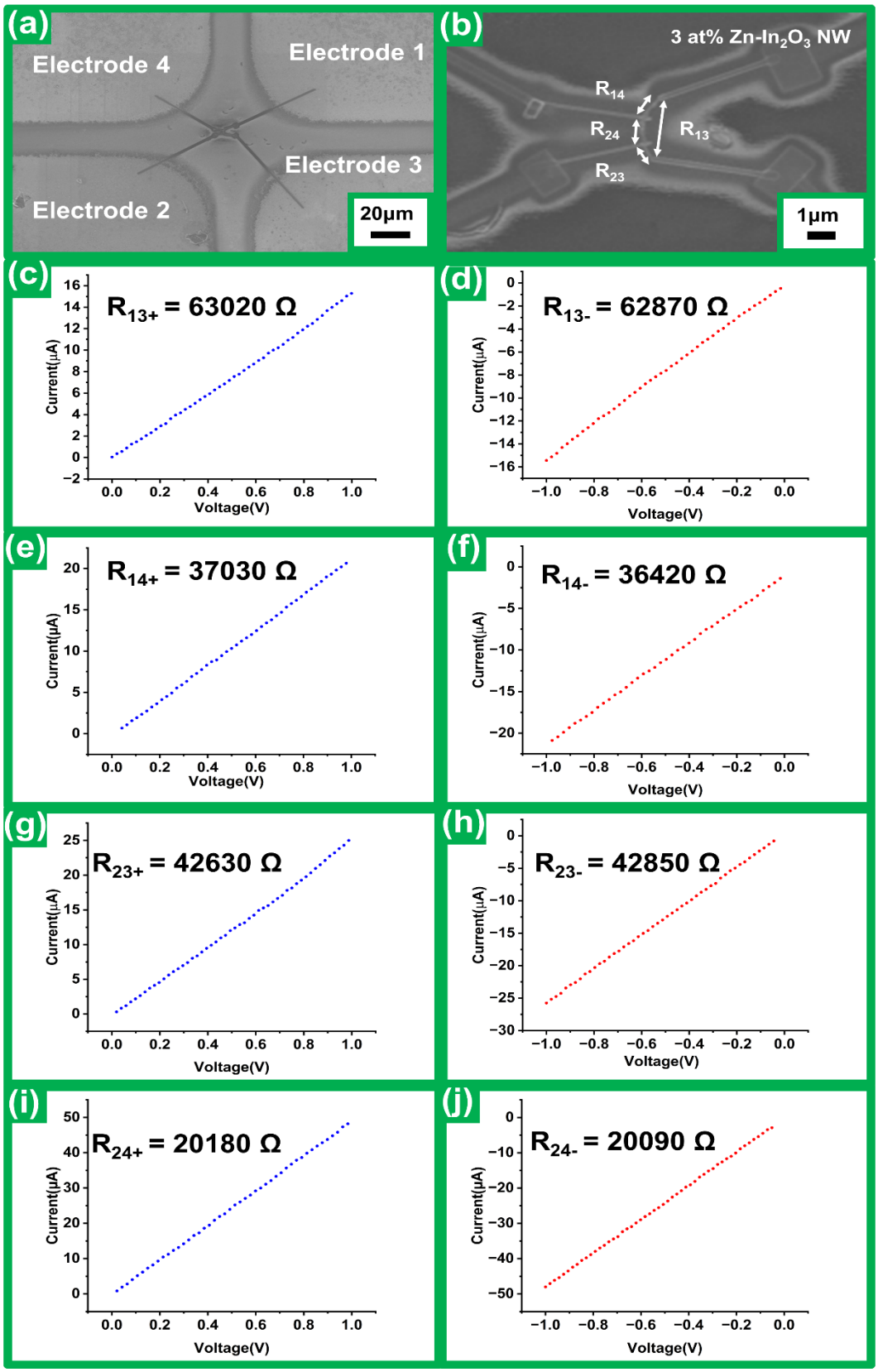

Figure S6. (a,b) SEM image of single 3 at% Zn-In_2O_3 nanowire-based electrical measurement micro-device. I-V measurements of 3 at% Zn- In_2O_3 nanowire. (c) R_{13+} (d) R_{13-} (e) R_{14+} (f) R_{14-} (g) R_{23+} (h) R_{23-} (i) R_{24+} (j) R_{24-}.

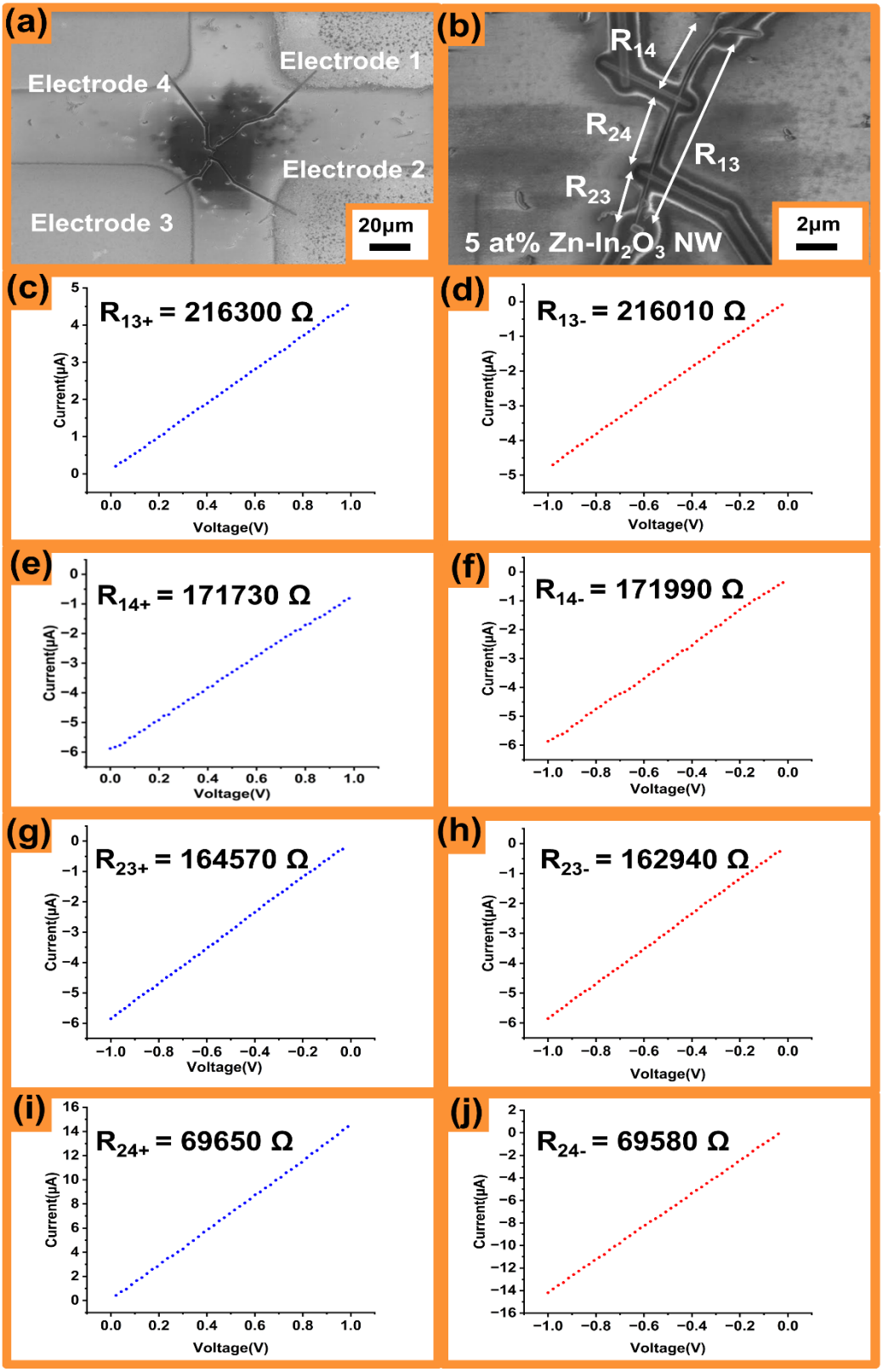

Figure S7. (a,b) SEM image of single 5 at% Zn-In_2O_3 nanowire-based electrical measurement micro-device. I-V measurements of 5 at% Zn-In_2O_3 nanowire. (c) R_{13+} (d) R_{13-} (e) R_{14+} (f) R_{14-} (g) R_{23+} (h) R_{23-} (i) R_{24+} (j) R_{24-}.

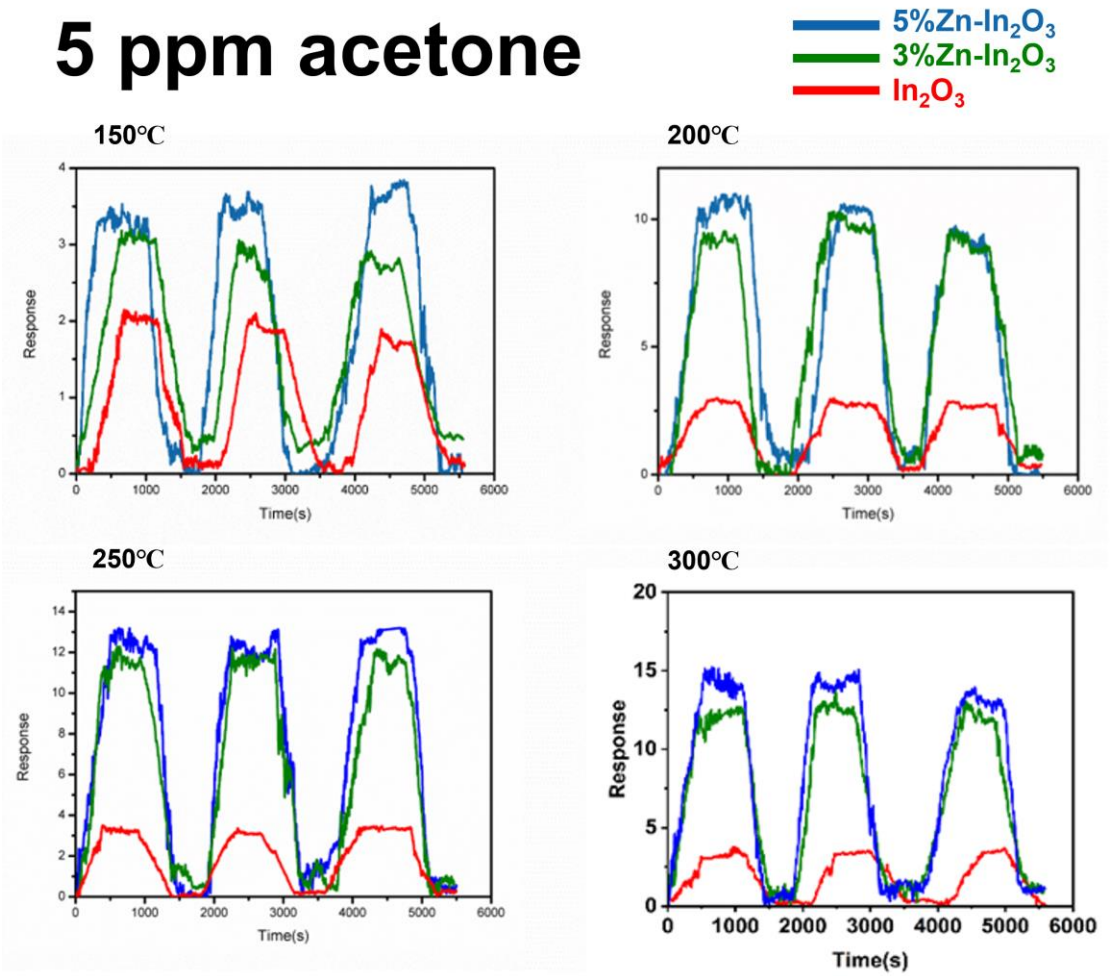

Figure S8. (a-d) Dynamic gas sensing curves of single In_2O_3 nanowire, 3 at% Zn-In_2O_3 nanowire and 5 at% Zn-In_2O_3 nanowire at 150 °C, 200 °C, 250 °C and 300 °C to 5 ppm acetone.

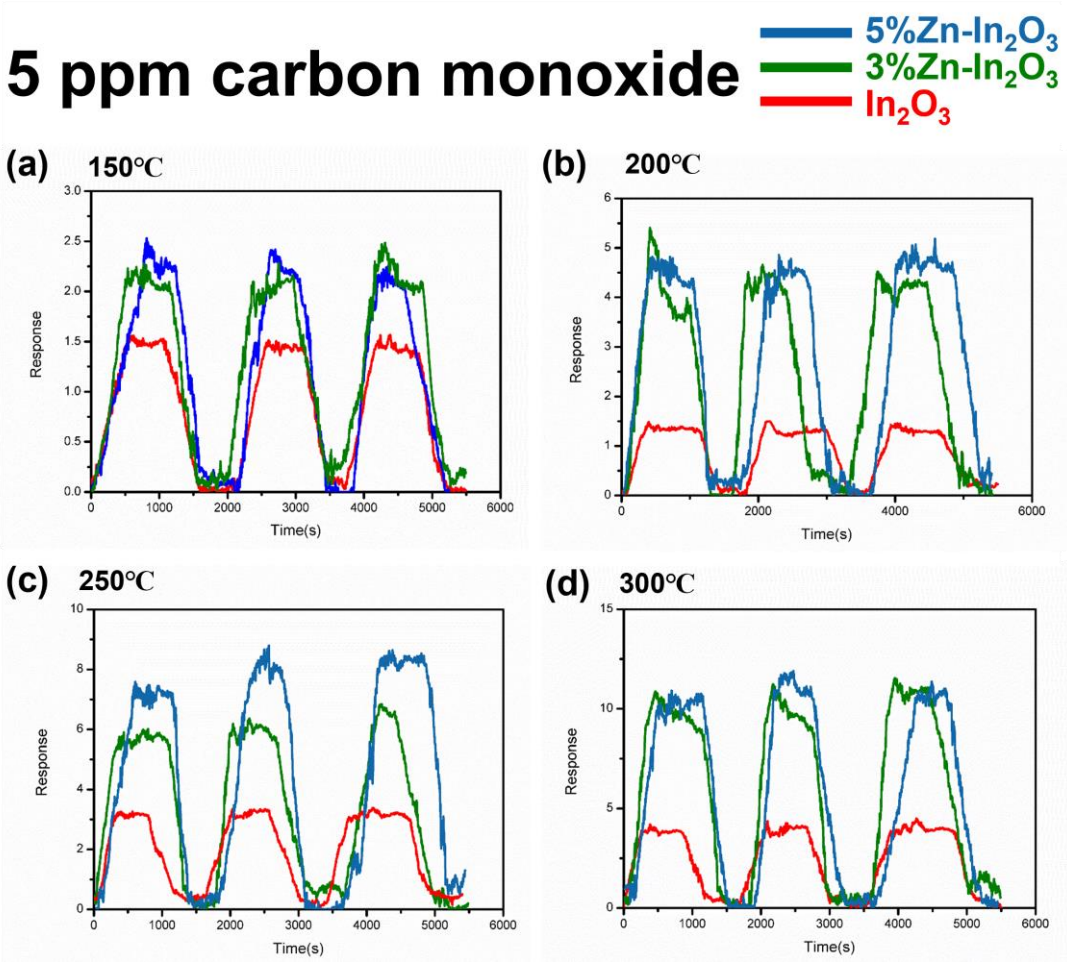

Figure S9. (a-d) Dynamic gas sensing curves of single In_2O_3 nanowire, 3 at% Zn-In_2O_3 nanowire and 5 at% Zn-In_2O_3 nanowire at 150 °C, 200 °C, 250 °C, and 300 °C to 5 ppm carbon monoxide.

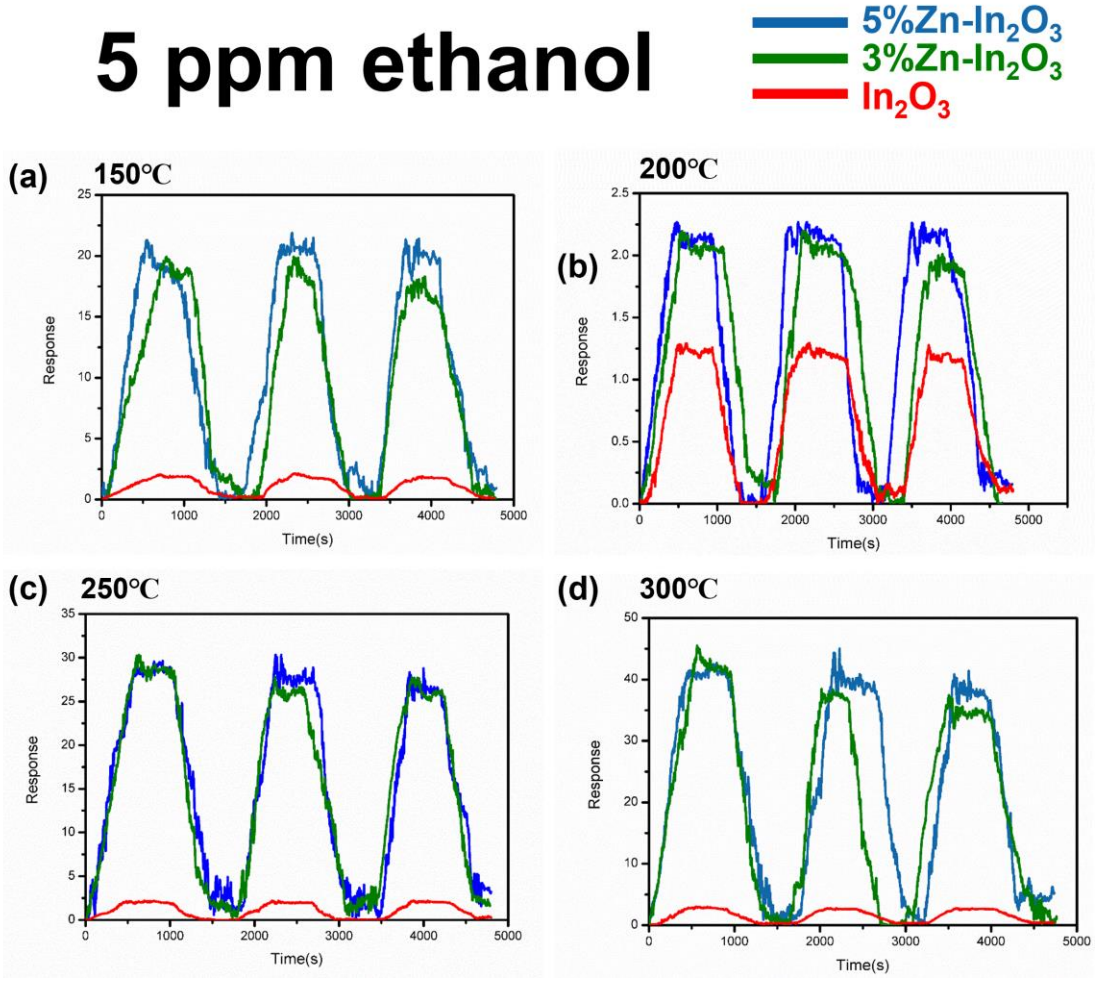

Figure S10. (a-d) Dynamic gas sensing curves of single In_2O_3 nanowire, 3 at% Zn-In_2O_3 nanowire and 5 at% Zn-In_2O_3 nanowire at 150 °C, 200 °C, 250 °C and 300 °C to 5 ppm ethanol.

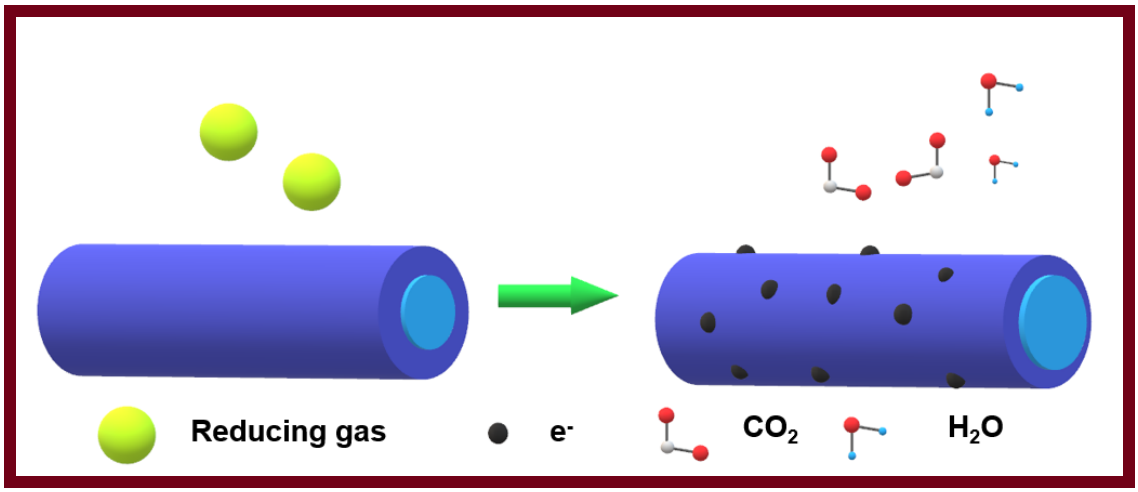

Figure S11. Schematic illustration of the change of electron depletion region after n-type semiconductor absorbs reducing gas.

Table S1. Summary of gas sensing performance of In_2O_3, 3 at% Zn-In_2O_3, 5 at% Zn-In_2O_3 nanowires.

Acetone	150°C	200°C	250°C	300°C
In_2O_3	2.0	2.9	3.5	3.4
3% Zn-In_2O_3	2.8	9.9	12.1	12.3
5% Zn-In_2O_3	3.5	10.9	13.2	13.9
Carbon monoxide	**150°C**	**200°C**	**250°C**	**300°C**
In_2O_3	1.5	1.2	3.2	3.8
3% Zn-In_2O_3	2.2	3.8	6.1	10.0
5% Zn-In_2O_3	2.3	4.5	7.2	10.8
Ethanol	**150°C**	**200°C**	**250°C**	**300°C**
In_2O_3	1.3	1.8	2.2	2.5
3% Zn-In_2O_3	2.2	18.1	30.7	36.8
5% Zn-In_2O_3	2.3	20.1	29.7	40.7

Table S2. Comparison with previous sensing studies on In_2O_3 nanowires with different dopants for 5ppm ethanol.

Sensing element	Gas concentration	Temperature	Response	Reference
In_2O_3 NW	5ppm	300°C	2.5	This work
3% Zn-doped In_2O_3 NW	5ppm	300°C	36.8	This work
5% Zn-doped In_2O_3 NW	5ppm	300°C	40.7	This work
In_2O_3 NWs	20ppm	300°C	30	[5]
5% Sn-doped In2O3 NWs	10ppm	400°C	5	[22]
0.5% Co-doped In2O3 NWs	100ppm	300°C	16	[23]

Table S3. Comparison with previous sensing studies on In_2O_3 nanostructures with different dopants for 5ppm acetone.

Sensing element	Gas concentration	Temperature	Response	Reference
In_2O_3 NW	5ppm	300°C	3.4	This work
3% Zn-doped In_2O_3 NW	5ppm	300°C	12.3	This work
5% Zn-doped In_2O_3 NW	5ppm	300°C	13.9	This work
Electrospinning In_2O_3 NWs	10ppm	200°C	10	[24]
3% Ag-doped In2O3 NPs	50ppm	300°C	7	[25]
0.5% Co-doped In2O3 NPs	5ppm	240°C	4	[26]