Supplementary Information

Supersaturation-controlled synthesis of diverse In\textsubscript{2}O\textsubscript{3} morphologies and their shapes-dependent sensing performances†

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**Fig. S1** Schematic illustration of the apparatus used for the synthesis of diverse In$_2$O$_3$ morphologies by nitriding In$_2$O$_3$ under NH$_3$ flow at 700 °C for 2 h and subsequently re-oxidized for another 1 h at the same temperature.

**Fig.S2** The measuring electric circuit for the gas sensor.
Fig. S3 (a) TEM image of representative In$_2$O$_3$ octahedron strings; (b) HRTEM image of individual In$_2$O$_3$ octahedron strings, showing the boundary of the upper and lower part; (c, d) HRTEM images of the individual In$_2$O$_3$ octahedron strings, exhibiting that both the upper and lower part of the crystals in the In$_2$O$_3$ octahedron strings grew in the same direction.
**Fig. S4** SEM image of the as-obtained In\(_2\)O\(_3\) product (re-introducing air to the evacuated reaction system).

**Fig. S5** SEM images of In\(_2\)O\(_3\) structures deposited on the surface of the silicon substrates located at region 1 using 100 mg In\(_2\)O\(_3\) as starting materials at (a) 600 °C and (b) 650 °C, respectively.
Fig. S6 SEM images of the (a) octahedron strings, (b) nanowires, (c) crystal chains, and (d) lollipop-like structures. All the insets were schematically illustrated in every SEM images.