Supplementary Information for

**Uniform Porous Multilayer-Junction Thin Film for Enhanced Gas-Sensing Performance**

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**Fig. S1** Schematic of the gas sensing measurement system and the cross-sectional schematic of gas sensor based on bilayer $\text{In}_2\text{O}_3/\text{CuO}$ porous thin film nanostructures.
**Fig. S2** XRD patterns of pure In$_2$O$_3$, CuO, and In$_2$O$_3$/CuO bilayer porous thin films.

**Fig. S3** The high resolution XPS spectra of (a) In 3d and (b) Cu 2p in the In$_2$O$_3$/CuO bilayer porous thin film.
**Fig. S4** The current–voltage characteristics for the sensors based on In$_2$O$_3$, CuO and In$_2$O$_3$/CuO porous thin film.

**Fig. S5** Four response transients of different gas sensors to different ethanol concentrations (50-1000 ppm) at 250°C working temperature.