Supporting Information

Effects of rare earth elements doping on ethanol gas-sensing performance of three-dimensionally ordered macroporous \( \text{In}_2\text{O}_3 \)

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**Fig. S1.** SEM images of PMMA microspheres

**Fig. S2.** SEM images of 3DOM \( \text{In}_2\text{O}_3 \) annealed at 550 °C (a, b), 600 °C (c, d), 650 °C (e, f)
The gas sensing properties to 100 ppm ethanol for 3DOM In\textsubscript{2}O\textsubscript{3} with 2\%, 5\%, 8\% doping ratio at various working temperature are shown in Fig. S5. Tm is an effective dopant to increase In\textsubscript{2}O\textsubscript{3} sensing response and decrease the operating temperature. In particular, the gas sensing sensitivity value increases with the increasing of Tm concentration from 2 \% to 5 \%, but decreases when the Tm concentration at 8 \%. Additionally, the optimum operating temperatures are at 230°C for pure In\textsubscript{2}O\textsubscript{3}, 200°C for 3DOM In\textsubscript{2}O\textsubscript{3}-2\% Tm, and 175°C for 5\% and 8\% Tm-doped. The experiment results show that the optimum performance can be achieved with 5\% doping ratio of Tm.
**Fig. S5** Gas response of pure and 3DOM In$_2$O$_3$-Tm to 100 ppm ethanol at different operating temperatures.

**Fig. S6.** Response curve of pure and RE doped 3DOM In$_2$O$_3$ to 100 ppm ethanol under the optimum working temperature of 175°C.

**Fig. S7.** Response and response/recovery time of pure and RE doped 3DOM In$_2$O$_3$ to 100 ppm ethanol.
Fig. S8. Gas response of pure and RE doped 3DOM In$_2$O$_3$ to different concentration of ethanol at the optimum operating temperature.