

## Supporting Information

### **Type discrimination and concentration prediction towards ethanol using machine learning enhanced gas sensor array with different morphology-tuning characteristics**

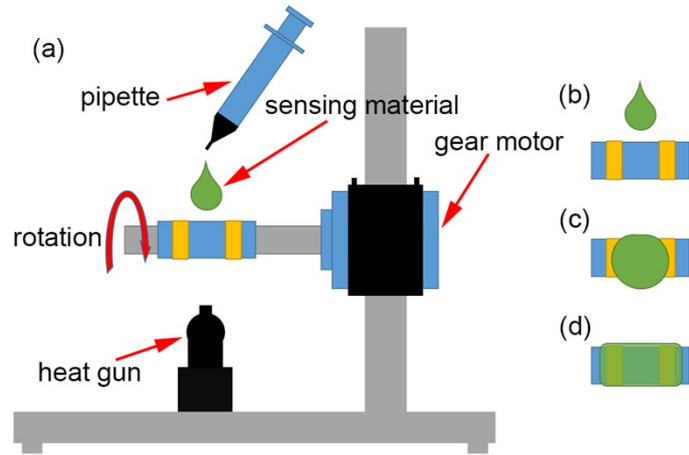
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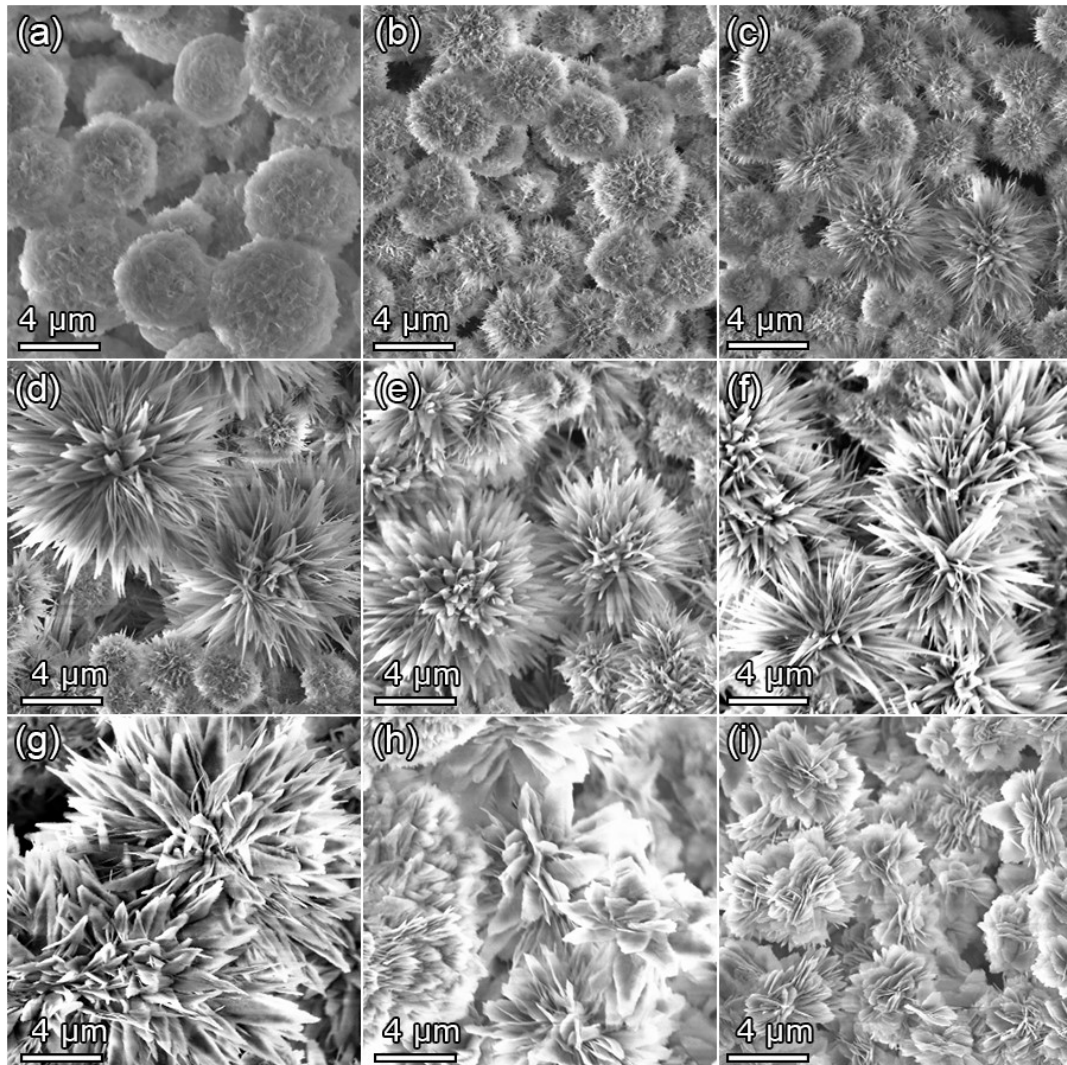
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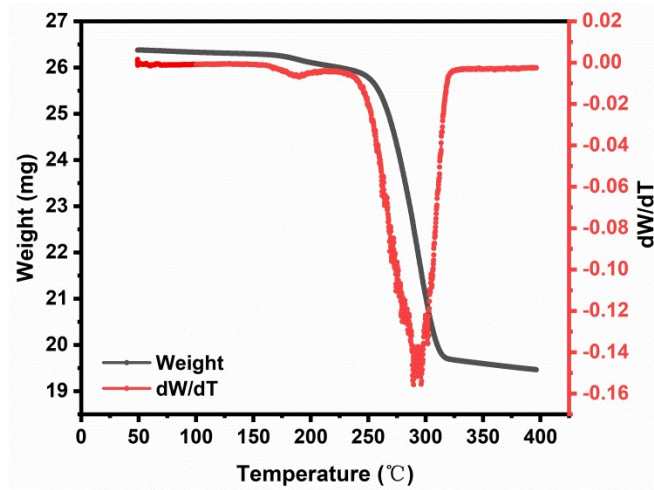
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qq593783531@163.com, zhiyang@sjtu.edu.cn



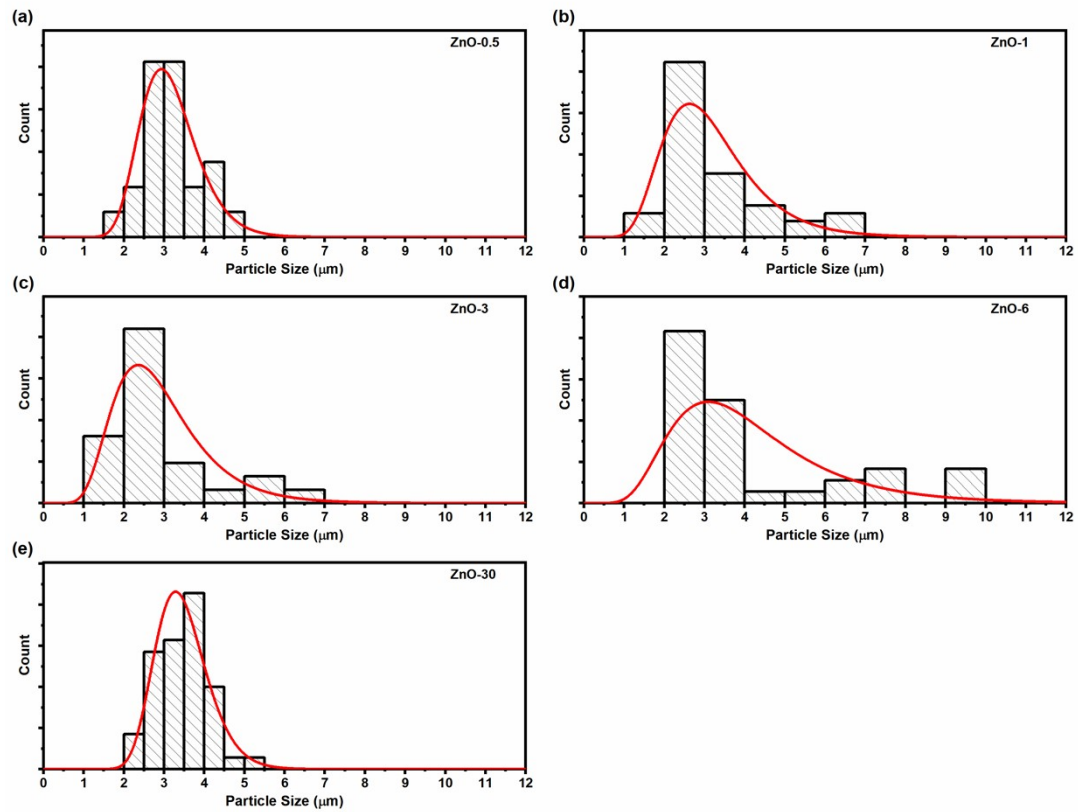
**Fig. S1.** (a) The home-made device for the construction of sensitive layer on ceramic tubes. (b, c, and d) The process of sensitive layer formation.



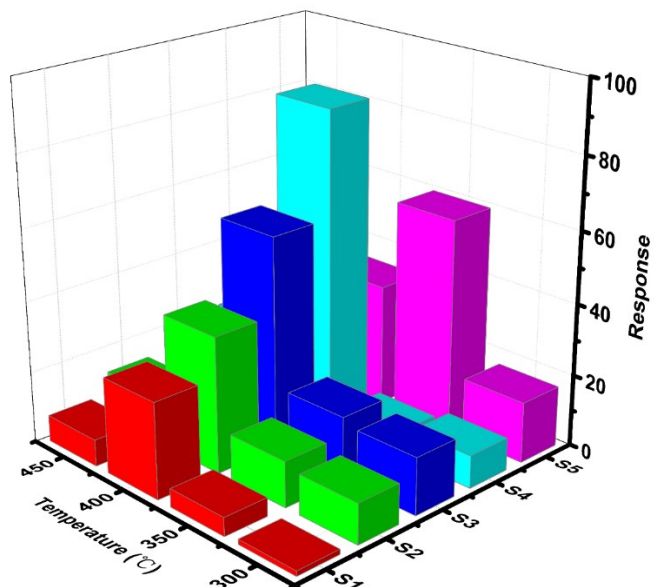
**Fig. S2.** SEM images of ZnO precursors and the corresponding urea content is (a) 0.5 g, (b) 1 g, (c) 1.5 g, (d) 2 g, (e) 2.5 g, (f) 3 g, (g) 6 g, (h) 12 g and (i) 30 g, respectively.



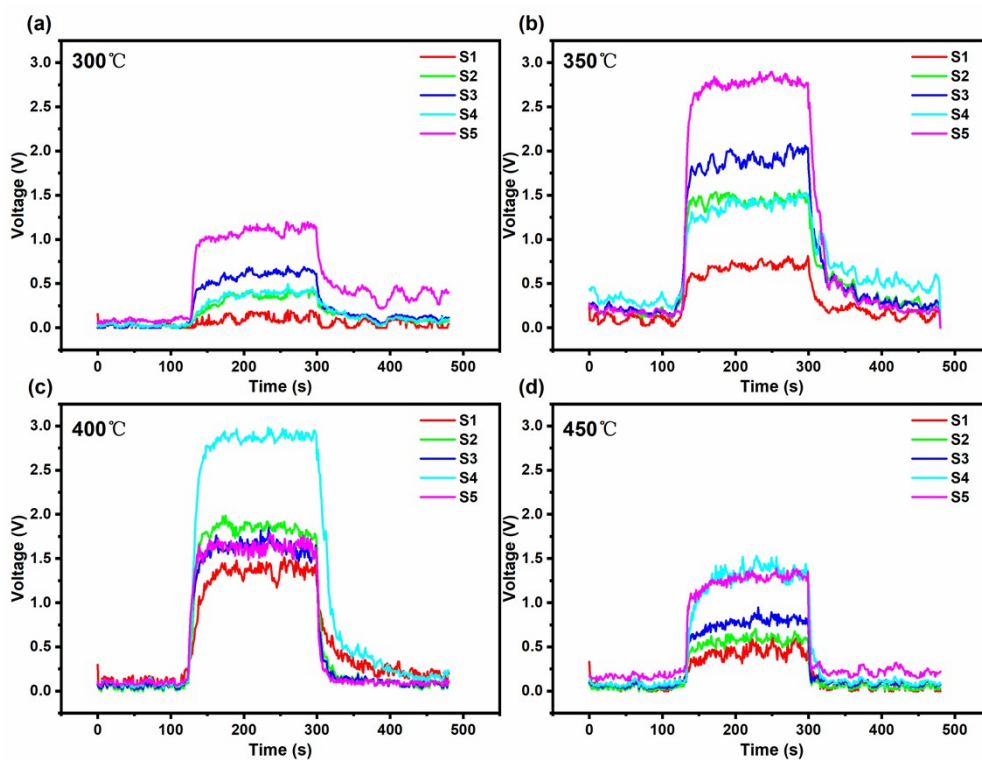
**Fig. S3.** TGA curve and its corresponding differential curve ( $dW/dT$ ) of ZnO precursor (Pre-ZnO-30).



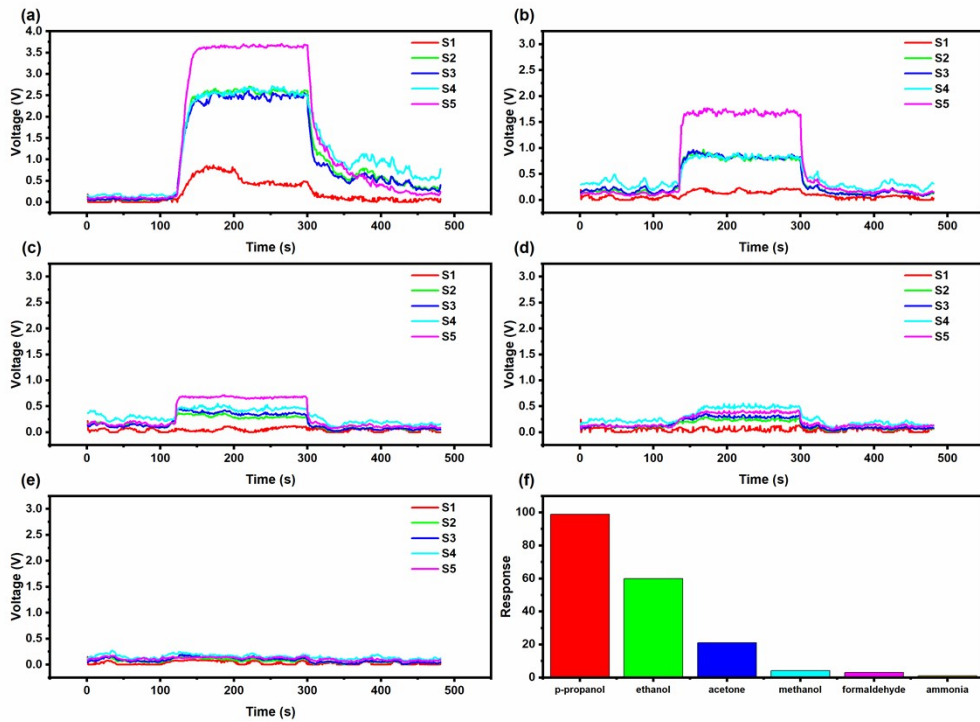
**Fig. S4.** Particle size distribution of (a) ZnO-0.5, (b) ZnO-1, (c) ZnO-3, (d) ZnO-6 and (e) ZnO-30, respectively.



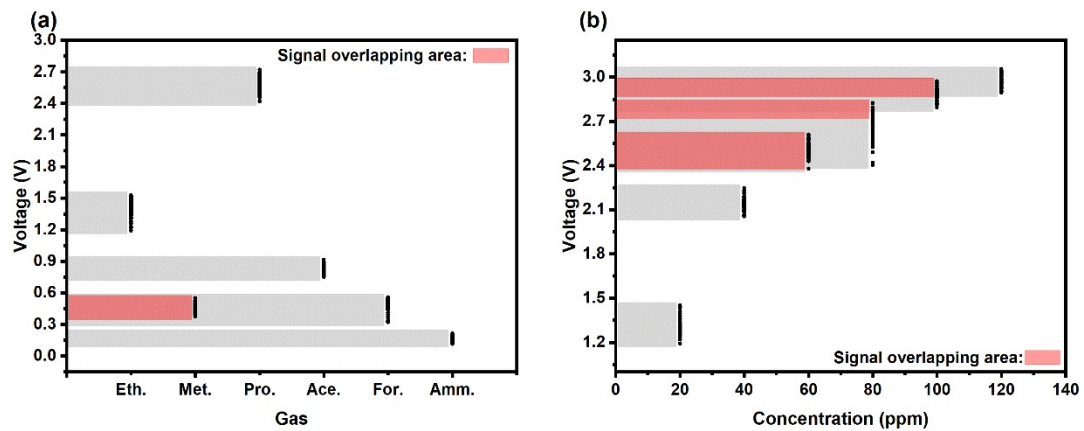
**Fig. S5.** Response of S1-S5 to ethanol at different working temperatures.



**Fig. S6.** Response and recovery curves of different gas sensors to ethanol at different working temperatures: (a) 300 °C, (b) 350 °C, (c) 400 °C and (d) 450 °C, respectively.



**Fig. S7.** Response curves of different gas detectors at 350 °C towards 100 ppm of (a) p-propanol, (b) acetone, (c) methanol, (d) formaldehyde and (e) ammonia, respectively. (f) Response values of S5 at 350 °C towards 100 ppm of p-propanol, ethanol, acetone, methanol, formaldehyde and ammonia, respectively.



**Fig. S8.** (a) Signal overlapping area of S4 to different kinds of gases. (b) Signal overlapping areas of S5 to different concentrations of ethanol.