Supporting Information

Ionic liquid-assisted synthesis of α-Fe_2O_3 mesoporous nanorod arrays and their excellent trimethylamine gas-sensing properties for monitoring fish freshness

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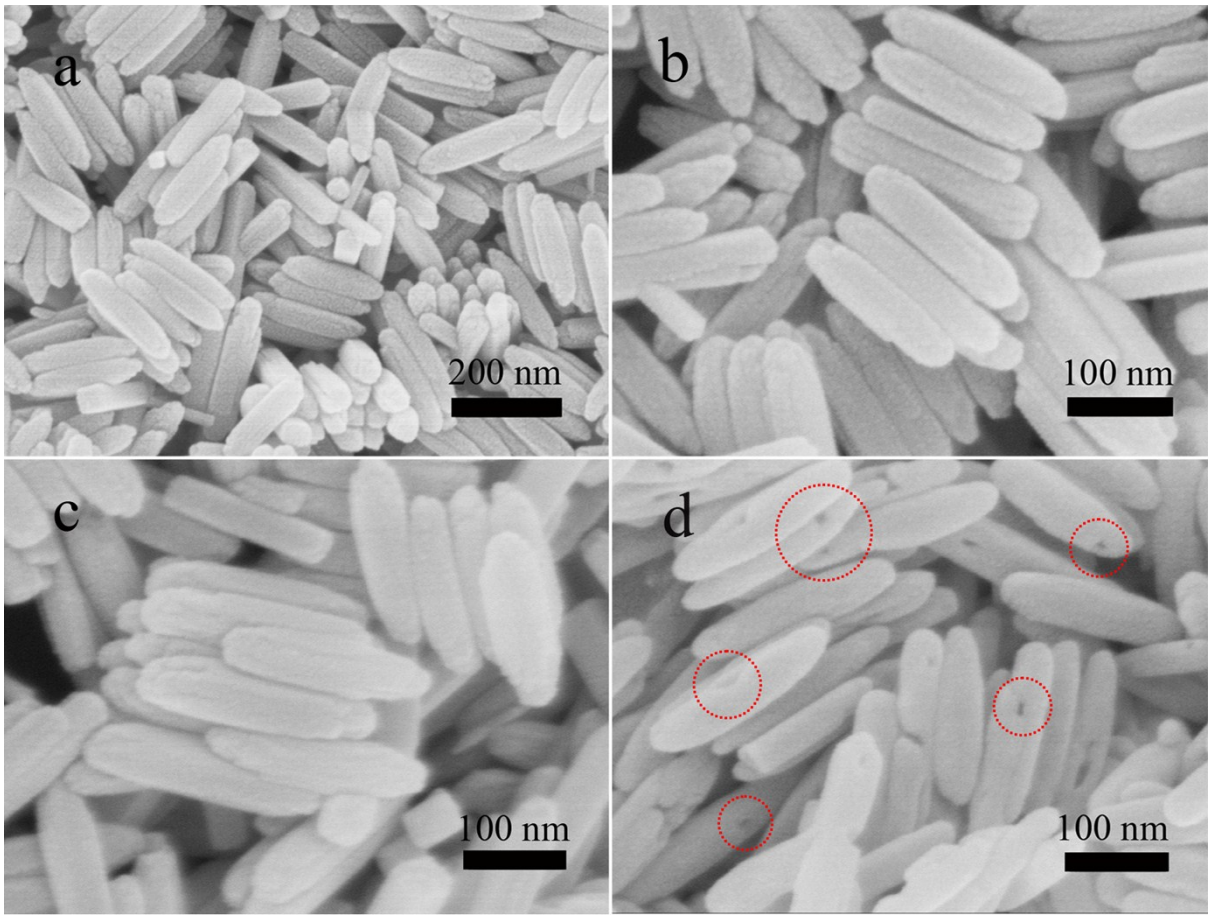

Fig. S1. Typical SEM images of precursor sample 1 (a), sample 1-250 (b), sample 1- 400 (c) and sample 1- 600 (d) precipitated at the bottom of the autoclave.

The SEM image (Fig. S1a) reveals that the as-obtained 1D structure is assembled by smaller nanoparticles. The constructed primary units, diameter and length of the α-Fe_2O_3 nanorods are not obviously changed after the precursors are thermal treated from 250 °C to 600 °C (Fig. S1b-S1d). But many obvious mesopores form on the surface of α-Fe_2O_3 nanorods (Fig. S1d) when the sample is calcined at 600 °C.

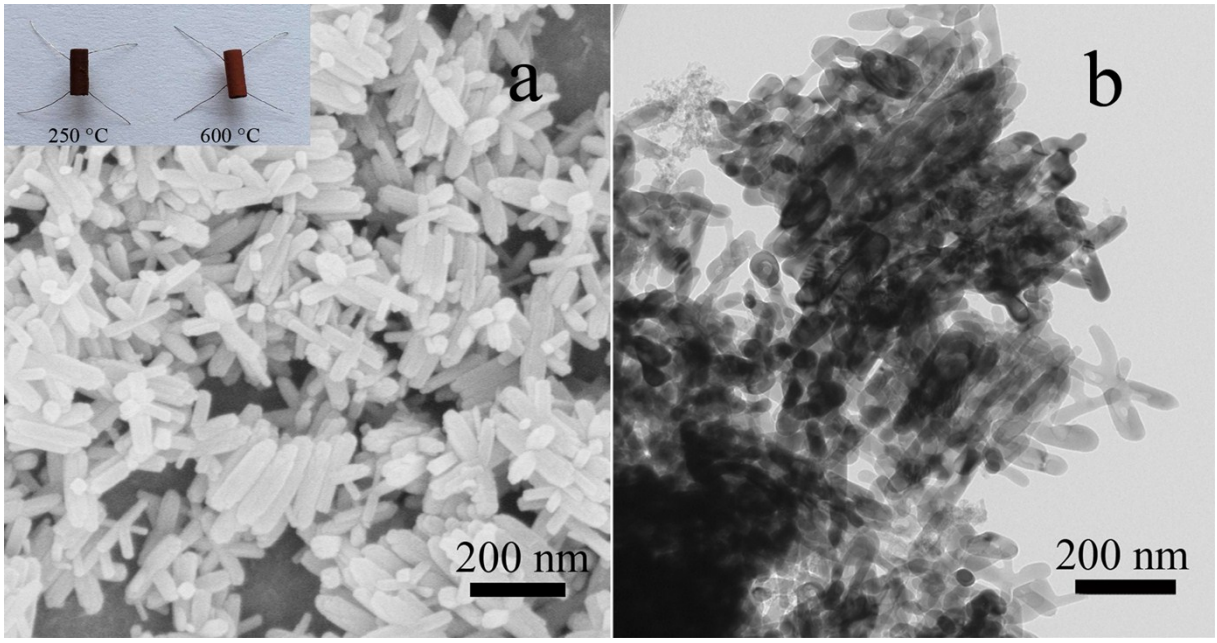

Fig. S2. Typical SEM, Picture (inset) (a) and TEM (b) images of sample 2 after calcined at 600 °C.

Fig. S 2 shows that sample 2 annealed at 600 °C is disordered nanorods with lengths ranging from 50 to 250 nm with an average length of 180 nm, which exposed their uneven porous structure.

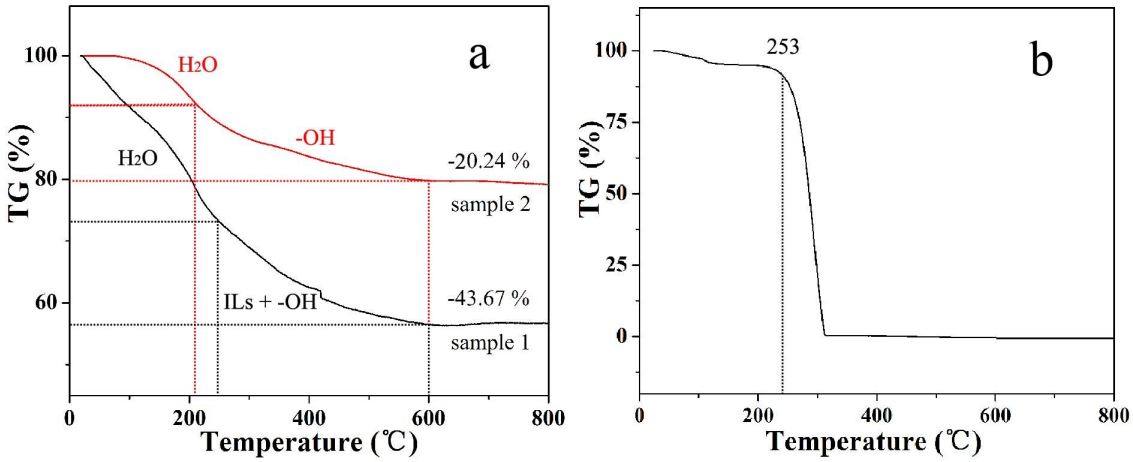

Fig. S3. TG curves of α-Fe_2O_3 precursors of sample 2 and sample 1 (a); TG curve of [C_{12}mim][Br] (b).

The formation of different porous structure of sample 1 and sample 2 was also studied by

TG analysis (Fig. S3). The weight loss of sample 2 is about 20.24 wt% when the sample is heated from room temperature to 600 °C, which is resulted from the evaporation of adsorbed water and dehydroxylation of FeOOH. In the case of Sample 1, there is nearly 43.67 wt% weight loss until the temperature is increased to 600 °C, indicating the existence of a large amount of adsorption water, chemically bonded water and ionic liquid in the precursor. The regular pores are resulted from the thermal decomposition of the $[C_{12}mim][Br]$ residuals and thermal dehydration during the sintering process.

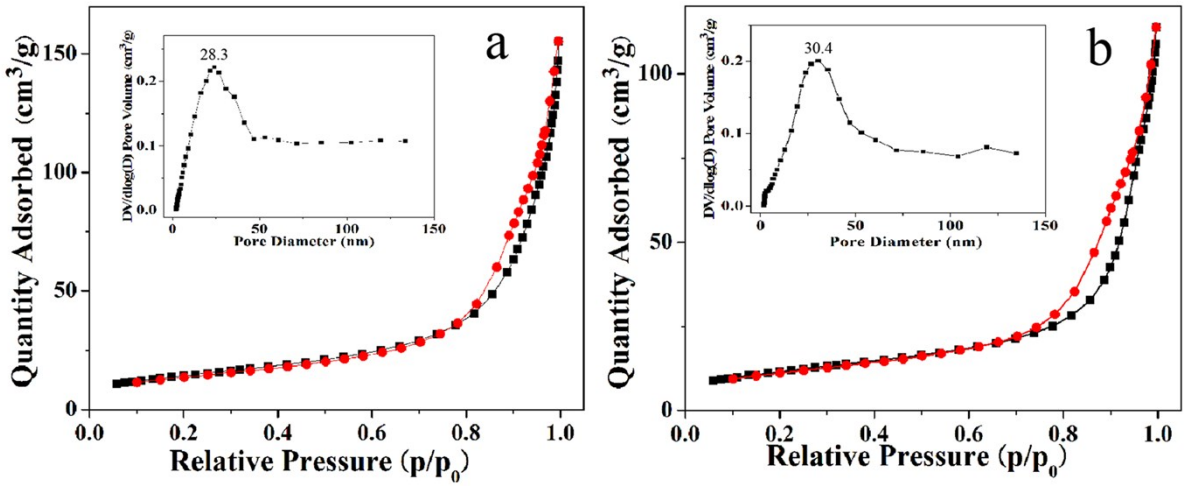

Fig. S4. Nitrogen adsorption-desorption isotherms and pore size distribution curve (inset) of sample 2 calcined at 250 °C (a) and 600 °C (b).

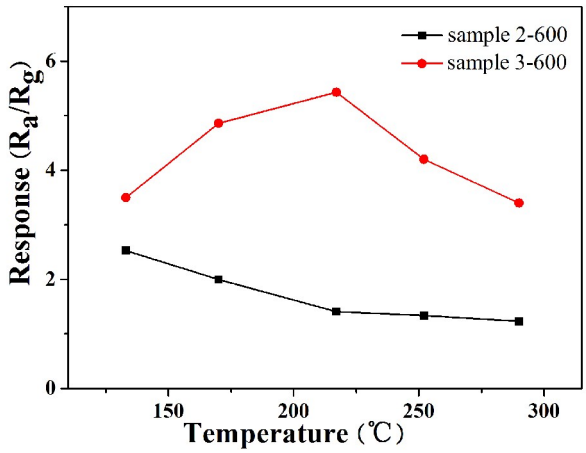

Fig. S5. The responses of the α-Fe_2O_3 nanorods sensors (sample 2-600 and sample 3-600) to 100 ppm TMA measured at different operating temperatures.

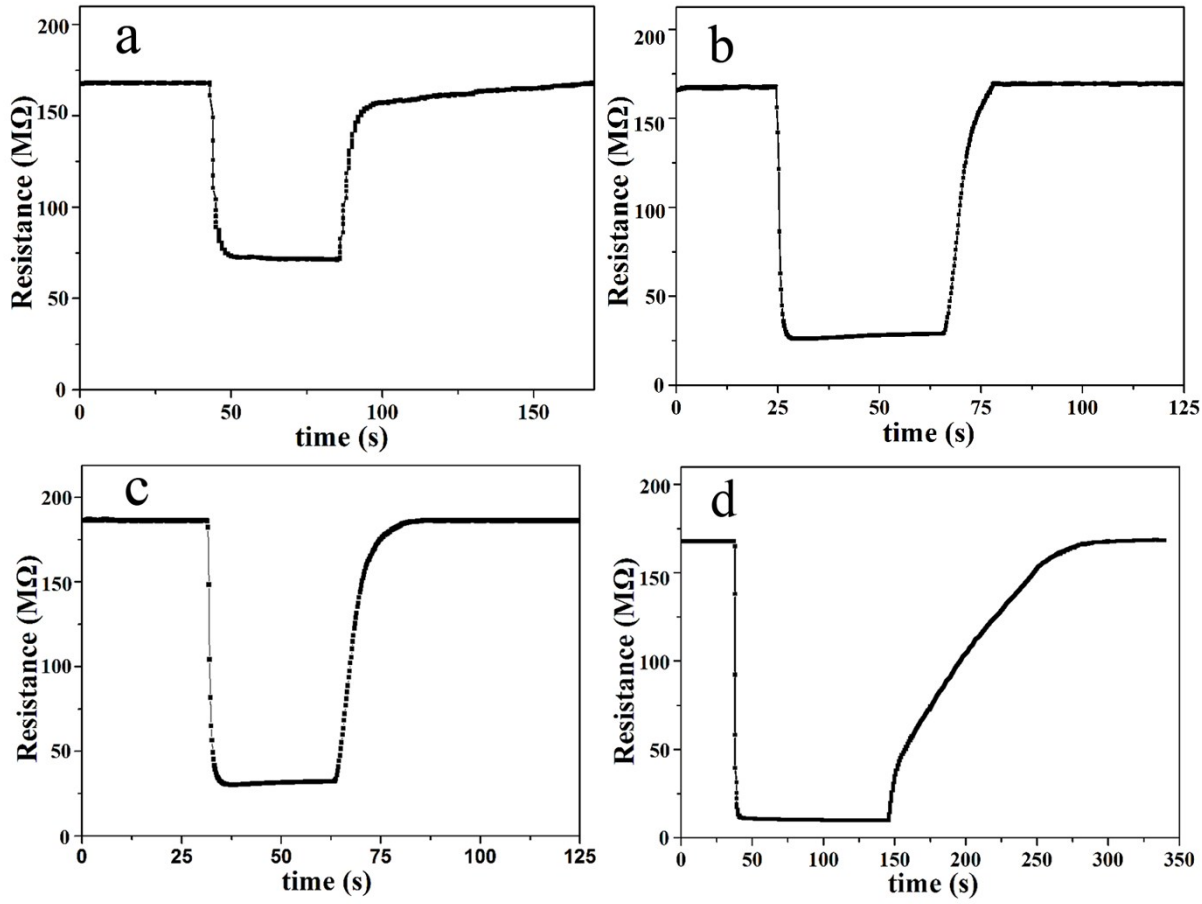

Fig. S6. Sensing transients of the α-Fe_2O_3 nanorod arrays sensor to volatiles (0 and 25 °C) come from fresh (a, c) and 11 h stored (b, d) fish measured at the working temperature of 217 °C.

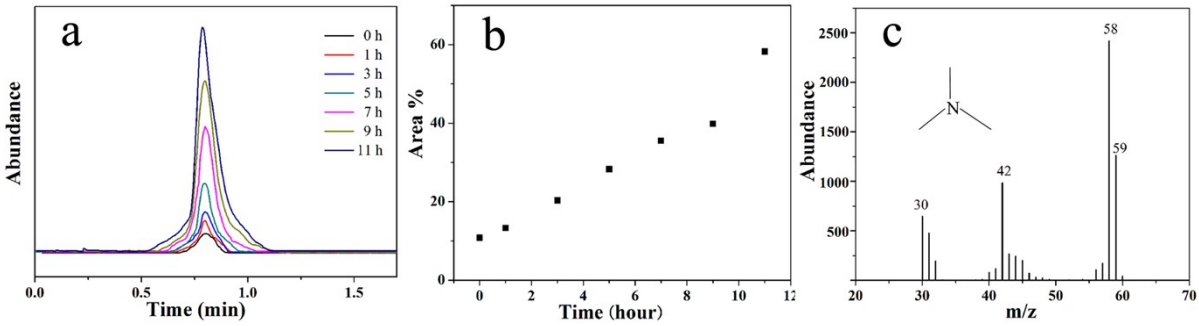

Fig. S7. GC chromatogram (a) and peak areas (b) of the volatiles from carassius auratus at different storage time at 25 °C, mass spectrum of TMA peak (0.79 min, c).

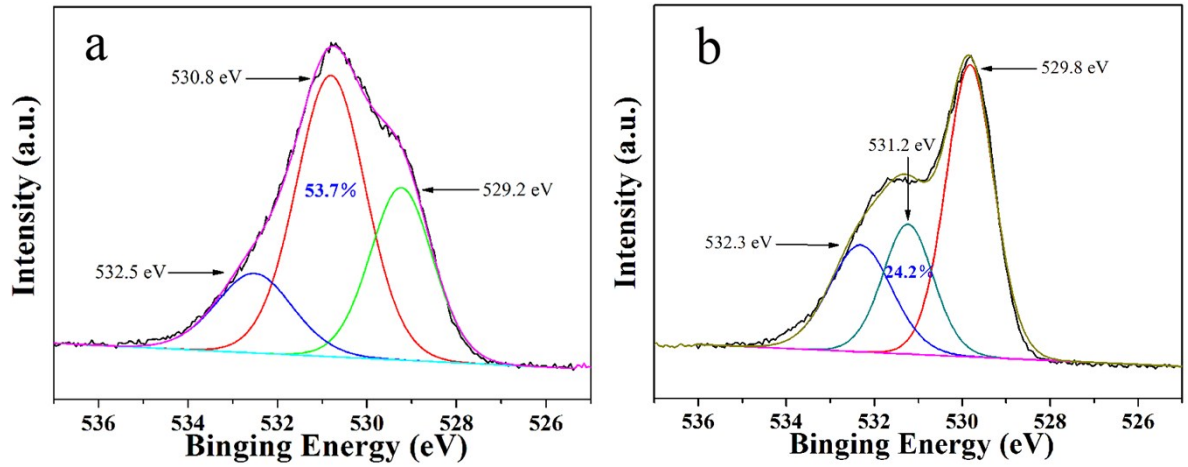

Fig. S8. O 1s XPS spectra of the α-Fe_2O_3 nanorod arrays (sample 1-250) sensor before (a) and after (b) exposure to 100 ppm to TMA at 217 °C.