Electronic Supplementary Material (ESI) for Journal of Materials Chemistry

Supporting Information Available

In situ diffusion growth of $Fe_2(MoO_4)_3$ nanocrystals on the surface of α-MoO_3 nanorods with significantly enhanced ethanol sensing properties

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SI-1 SEM image of α-MoO_3 nanorods

Figure S1 A typical SEM image of the pristine α-MoO_3 nanorods

SI-2 STEM images and the electron energy loss spectroscopy analysis of $Fe(OH)_3$@α-MoO_3 nanorods

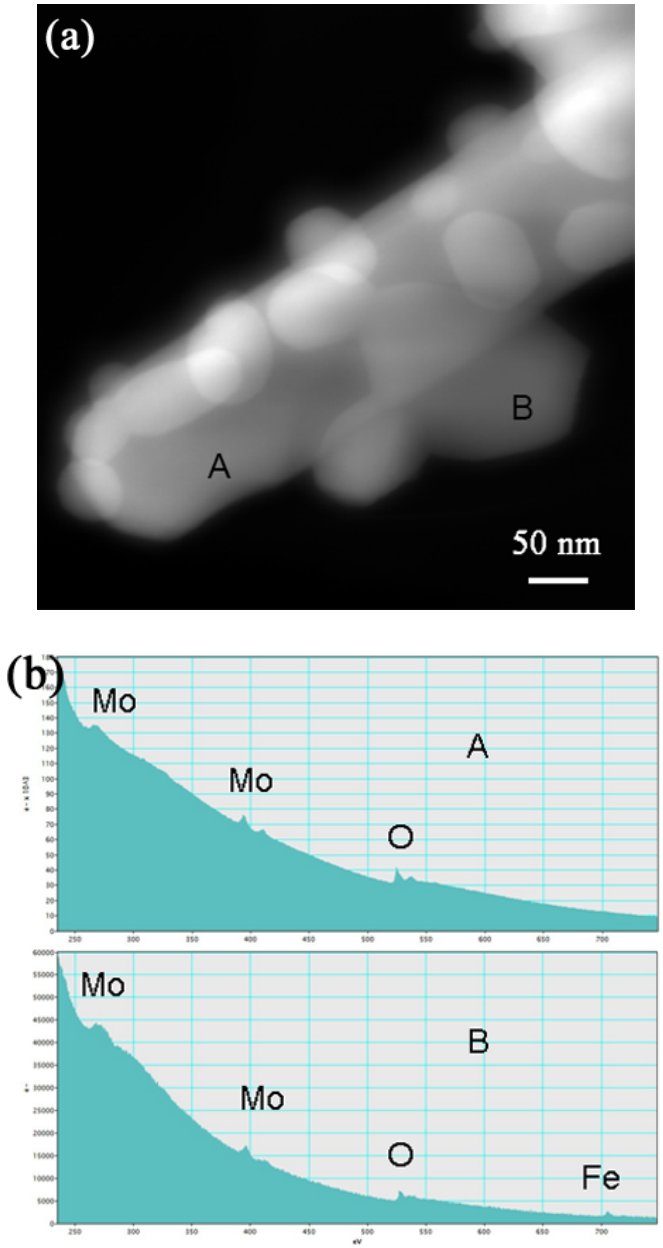

Figure S2 (a) STEM image of the $Fe_2(MoO_4)_3$@MoO_3 nanorod, and (b) the electron energy loss spectroscopy analysis taken at A and B areas in (a).

SI-3 SEM images of $Fe(OH)_3$@α-MoO_3 nanorods

Figure S3 A typical SEM images of $Fe(OH)_3$@α-MoO_3 nanorods.

SI-4 XRD pattern of $Fe(OH)_3$@α-MoO_3 nanorods

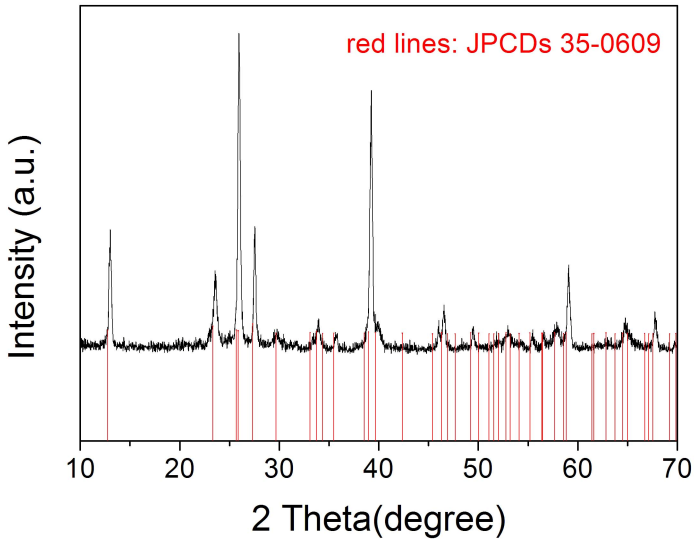

Figure S4 XRD pattern of the as-prepared $Fe(OH)_3$@α-MoO_3 nanorods

SI-5 TEM image of the sample obtained at 500℃ for 1h

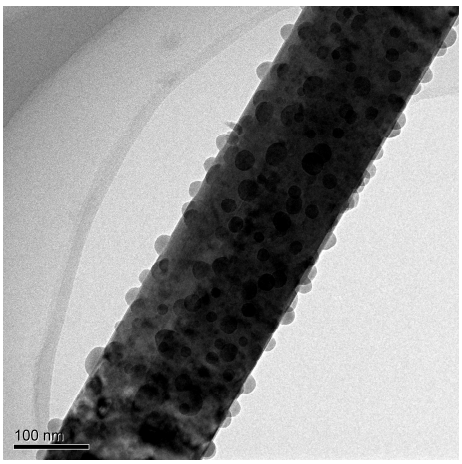

Figure S5 TEM image of the sample obtained at 500℃ for 1 h.

SI-6 TEM image of the sample obtained at 500℃ for 2 h

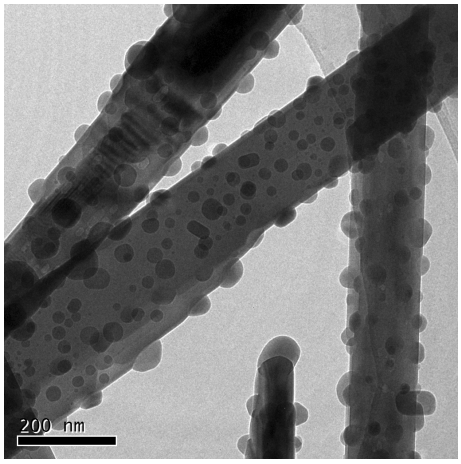

Figure S6 TEM image of the sample obtained at 500℃ for 2 h.

SI-7 TEM image of the sample obtained at 500℃ for 3 h

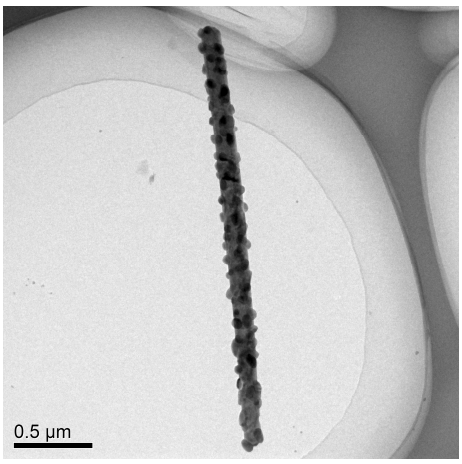

Figure S7 TEM image of the sample obtained at 500℃ for 3 h.

SI-8 Preparation of $Fe_2(MoO_4)_3$ nanocrystals and structural characterization

20 mL of 0.2 mol L^{-1} $Fe(NO_3)_3$ aqueous solution was added into 50 mL of 0.12 mol L^{-1} $(NH_4)_6Mo_7O_{24}$ aqueous solution under stirring. The mixture was stirred for 10 min. The precipitate was dried and then thermally treated at 500 ^oC for 4 h.

Fig. S9 shows the XRD pattern of the final product, in which blue lines denote the locations of the standard diffraction peaks of the monclinic $Fe_2(MoO_4)_3$ (JCPDS, 83–1701, cell parameters: a =15.70Å, b = 9.231Å, c =18.20Å, =125.2°). Compared with the standard data, all peaks, marked by Miller indices, can be indexed to monclinic $Fe_2(MoO_4)_3$. This reveals that the product mainly consists of crystallized $Fe_2(MoO_4)_3$.

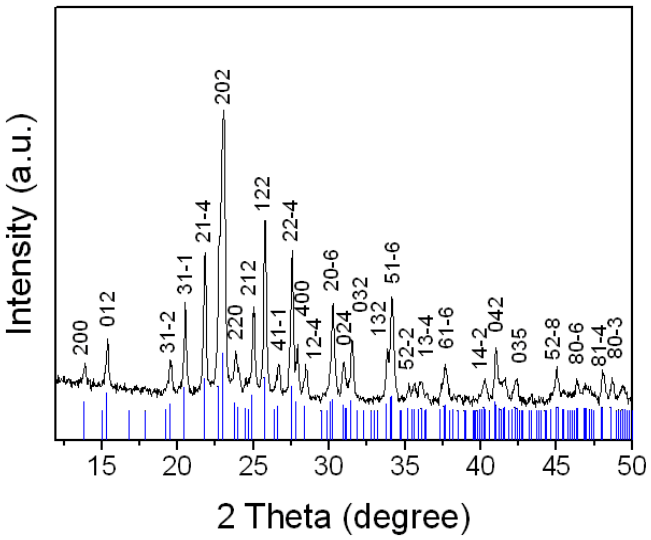

Figure S8 XRD pattern of crystalline $Fe_2(MoO_4)_3$ particles.

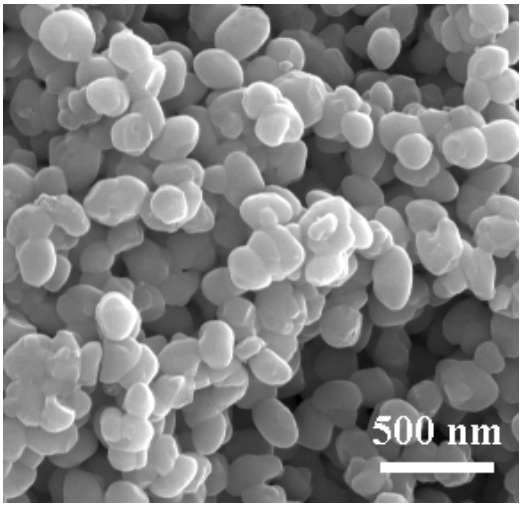

Figure S9 SEM image of crystalline $Fe_2(MoO_4)_3$ nanoparticles.

Fig. S9 shows a typical SEM image of crystallized $Fe_2(MoO_4)_3$ nanoparticles. It can be seen that an average diameter of $Fe_2(MoO_4)_3$ nanoparticles is about 200 nm.

SI-9 Sensor responses of $Fe_2(MoO_4)_3$@α-MoO_3 nanorods and $Fe_2(MoO_4)_3$ nanoparticles to 10 ppm ethanol

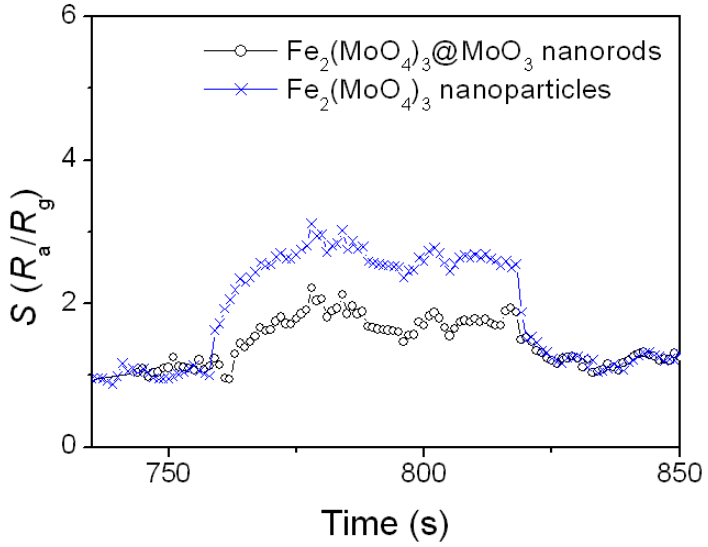

Fig. S10 Sensor responses of $Fe_2(MoO_4)_3$@α-MoO_3 nanorods and $Fe_2(MoO_4)_3$nanoparticles to 10 ppm ethanol at 220 ^oC.

SI-10 Stability of $Fe_2(MoO_4)_3$@α-MoO_3 nanorods to 100 ppm ethanol

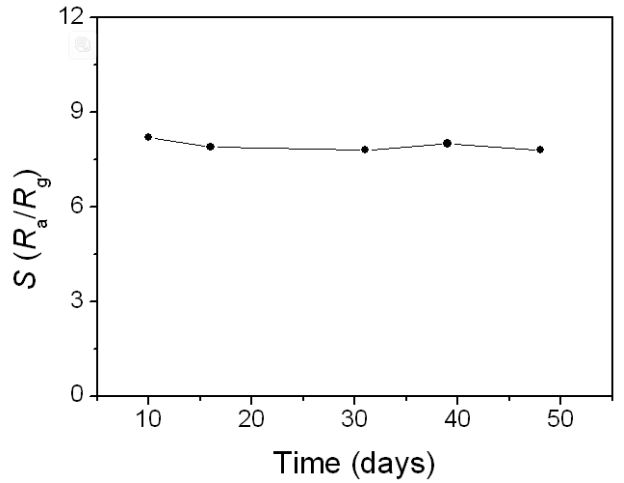

Fig. S11 Long-term stability of the $Fe_2(MoO_4)_3$@α-MoO_3 nanorods to 100 ppm ethanol at 220 ^oC.

SI-11 EDS patterns of the obtained $Fe_2(MoO_4)_3$@α-MoO_3 nanorods by adding different amounts of $Fe(NO_3)_3 \cdot 9H_2O$

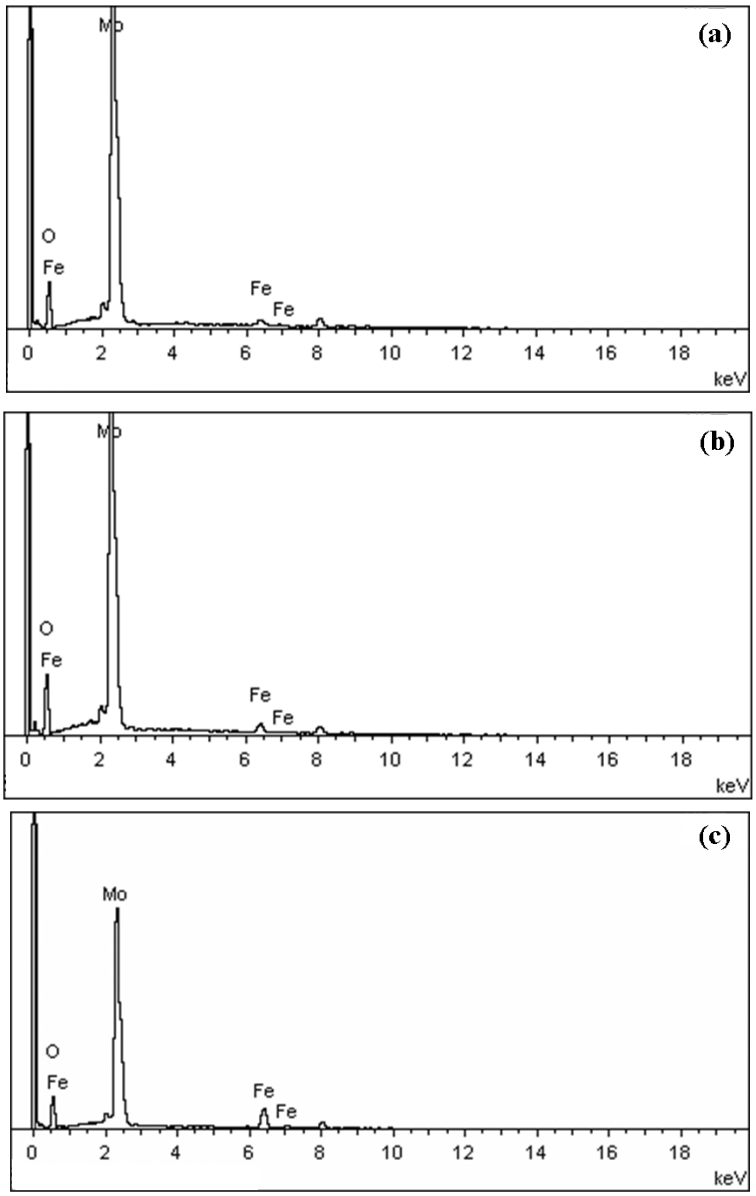

Fig. S12 EDS patterns of the obtained $Fe_2(MoO_4)_3$@α-MoO_3 nanorods by adding different amounts of $Fe(NO_3)_3 \cdot 9H_2O$: (a) 0.1 g of $Fe(NO_3)_3 \cdot 9H_2O$, (b) 0.3 g of $Fe(NO_3)_3 \cdot 9H_2O$ and (c) 0.6 g of $Fe(NO_3)_3 \cdot 9H_2O$.

Fig. S12 shows EDS patterns of the $Fe_2(MoO_4)_3$@α-MoO_3 nanorods obtained by adding different amount of $Fe(NO_3)_3 \cdot 9H_2O$ into the reaction solution. The molar ratios of Mo to Fe for the samples obtained by adding 0.1 g, 0.3g, 0.6g of

$Fe(NO_3)_3 \cdot 9H_2O$, are 17.7:1, 7.5:1 and 4:1, respectively. It indicates that the content of $Fe_2(MoO_4)_3$ nanocrystals in the nanocomposites is increased with increasing $Fe(NO_3)_3 \cdot 9H_2O$ amount.

SI-12 Selectivity of the $Fe_2(MoO_4)_3$@α-MoO_3 nanorods to different gases

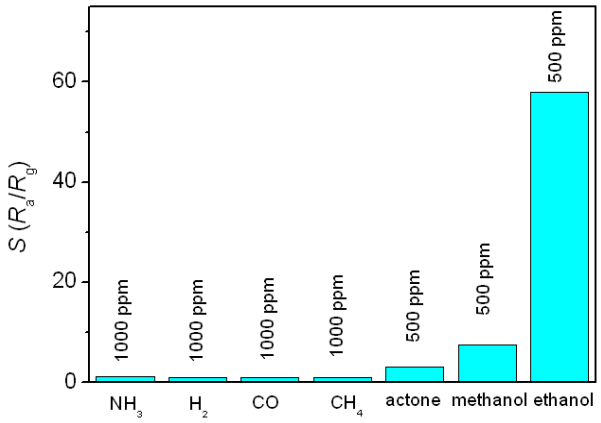

Fig. S 13 The sensitivity of the $Fe_2(MoO_4)_3$@α-MoO_3 nanorods to other gases at 220 °C.

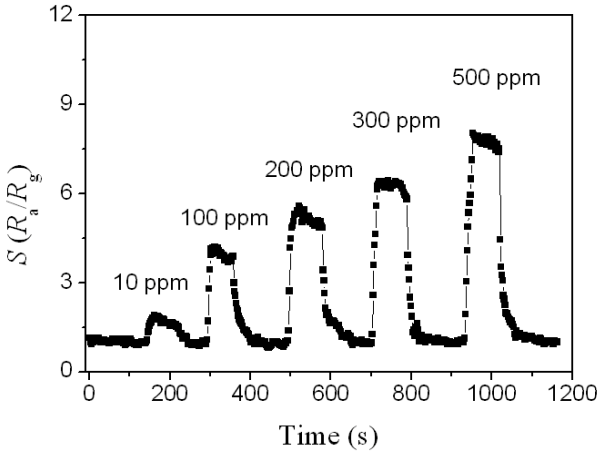

Fig. S 14 Time-dependent response of the $Fe_2(MoO_4)_3$@α-MoO_3 nanorods to methanol with different concentrations at 220 °C.