In situ controllable synthesis of magnetite nanocrystals/$CoSe_2$ hybrid nanobelts and their enhanced catalytic performance

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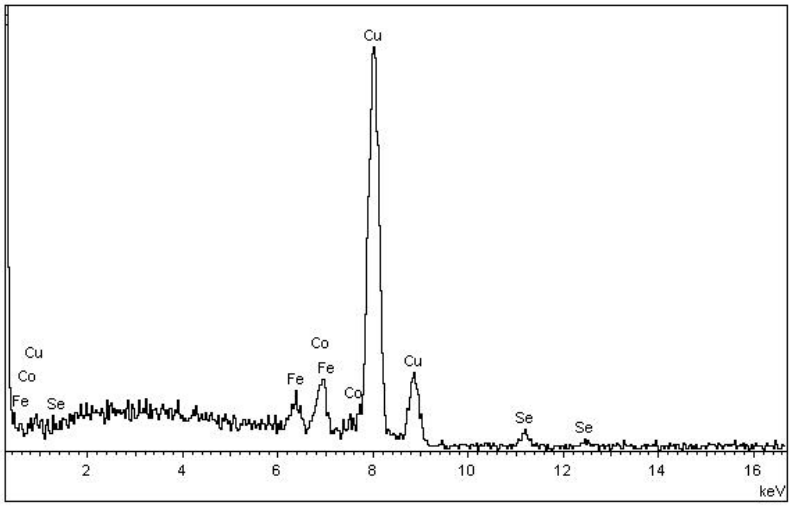

Fig. S1 Energy-disperse X-ray spectrum (EDS) taken on the selected area of the Fe_3O_4-decorated $CoSe_2$ nanobelts prepared in the presence of 3×10^{-4} mol $Fe(acac)_3$.

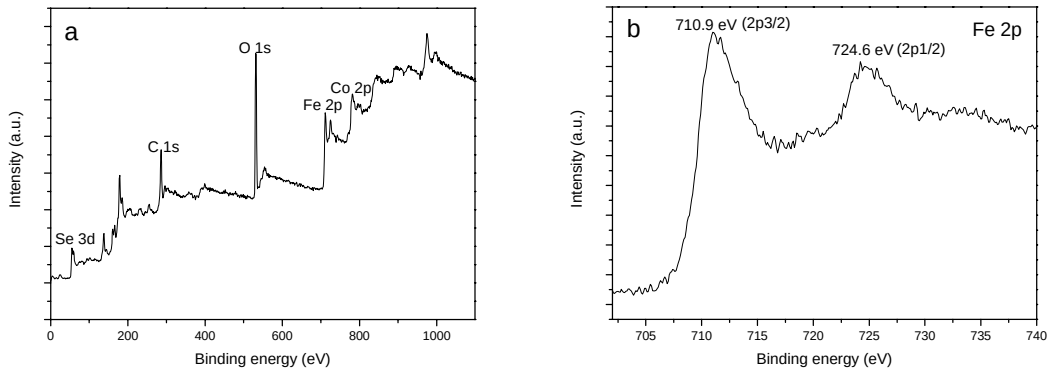

Fig. S2 XPS spectra for the obtained Fe_3O_4-decorated $CoSe_2$ nanobelts. (a) Survey of the sample; (b) Survey of Fe 2p region. The sample was prepared in the presence of 3×10^{-4} mol $Fe(acac)_3$. Only two peaks located at 710.9 eV and 724.6 eV could be observed in the Fe 2p spectrum, which could be assigned to Fe 2p3/2 and Fe 2p1/2 for Fe_3O_4 (T. Fujii, F. M. F. de Groot, G. A. Sawatzky, *Phys. Rev. B.* **1999**, 59, 3195.), indicating the formation of Fe_3O_4 in the composites.

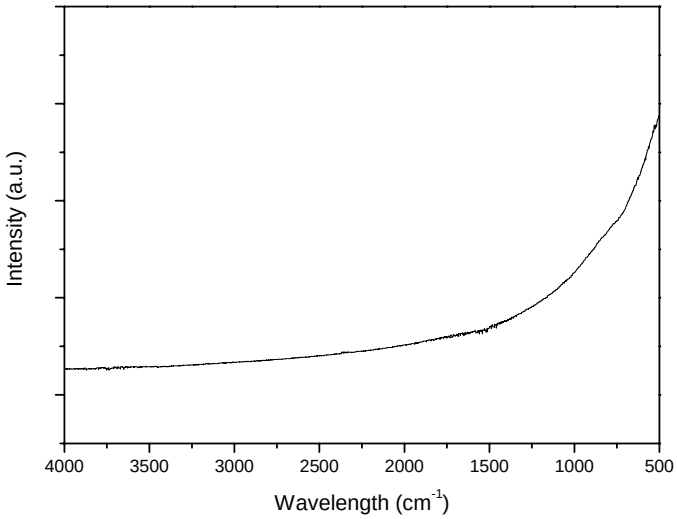

Fig. S3 FTIR spectrum of Fe_3O_4 NPs-decorated $CoSe_2$ hybrid NBs prepared in the presence of 3×10^{-4} $Fe(acac)_3$.

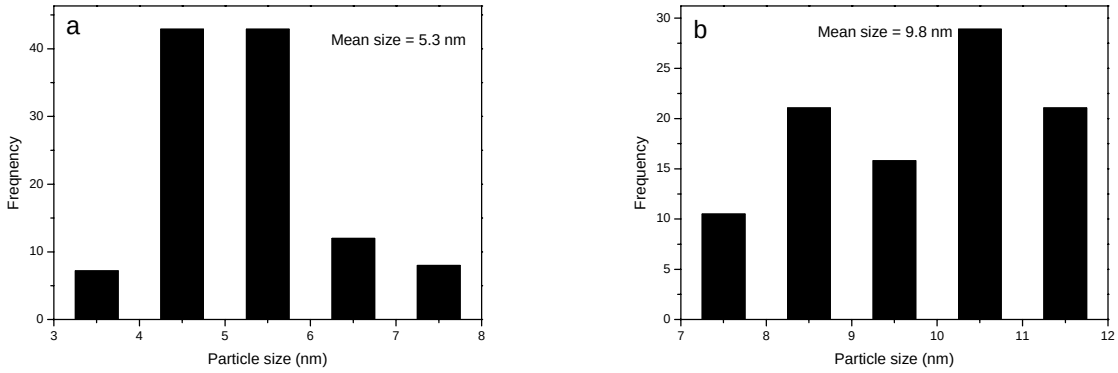

Fig. S4 The size distribution of loaded Fe_3O_4 NPs on hybrid $CoSe_2$-DETA NBs with different initial $Fe(acac)_3$ concentration: (a) 1.5×10^{-4} and (b) 6×10^{-4}, respectively.

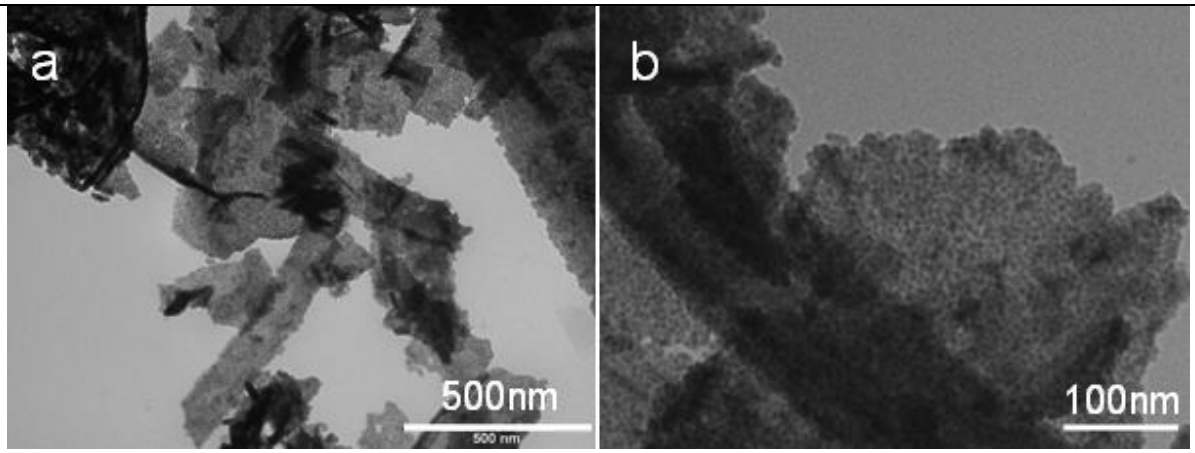

Fig. S5 (a, b) TEM and HRTEM images of Fe_3O_4-decorated $CoSe_2$ nanobelts after continuous strong ultrasonication treatment for 2 h.

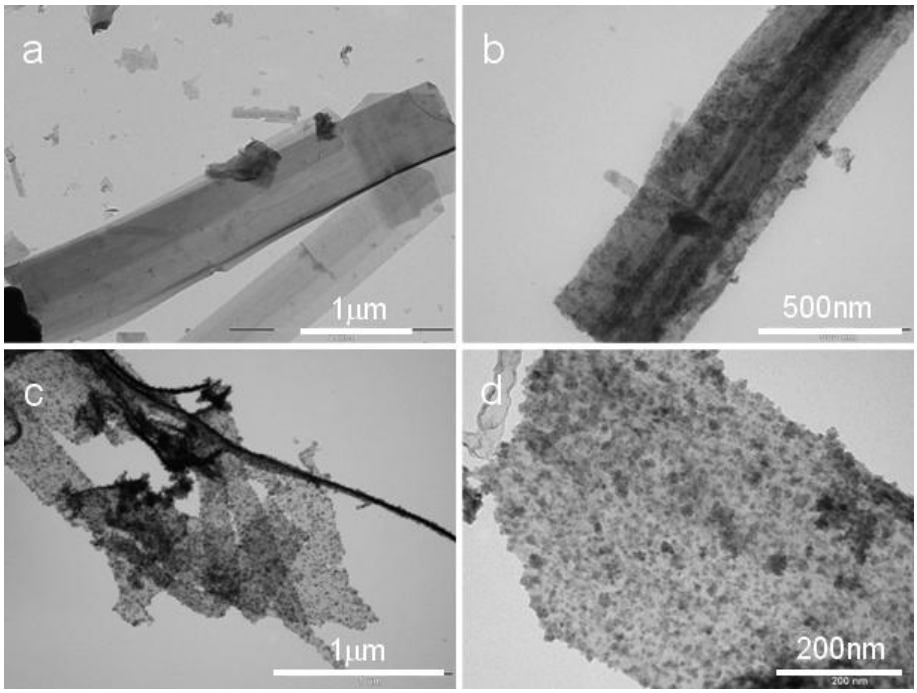

Fig. S6 TEM image of the samples collected at early stages of the reaction in the present of 3×10^{-4} mol $Fe(acac)_3$: (a) 260 ^oC for 30 min, (b) 278 ^oC for 5 min, (c) 278 ^oC for 10 min and (d) selective area magnification TEM image of (c).

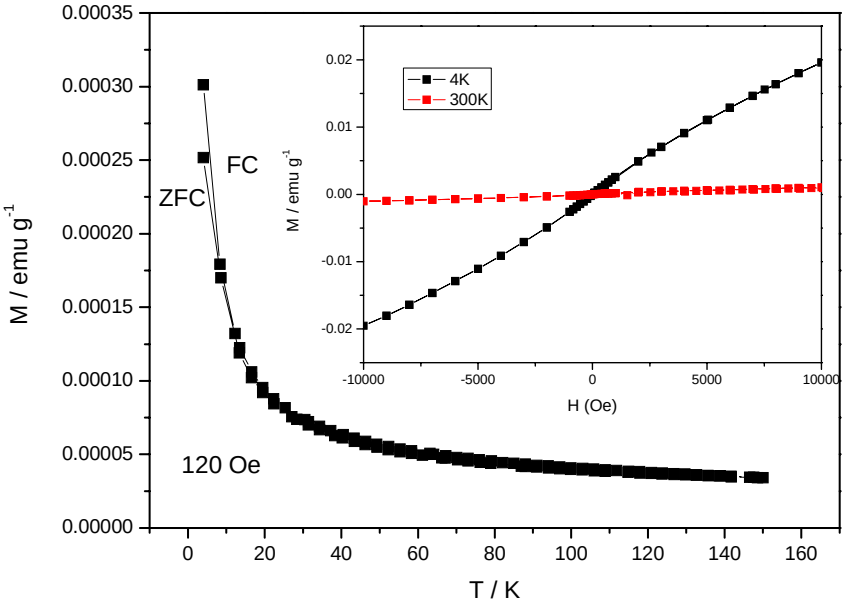

Fig. S7 Temperature dependence of magnetization for original $CoSe_2$-DETA nanobelts measured with applied field of 120 Oe after zero field cooling and field cooling. The inset shows the field dependence of the magnetization taken at 4 and 300 K.

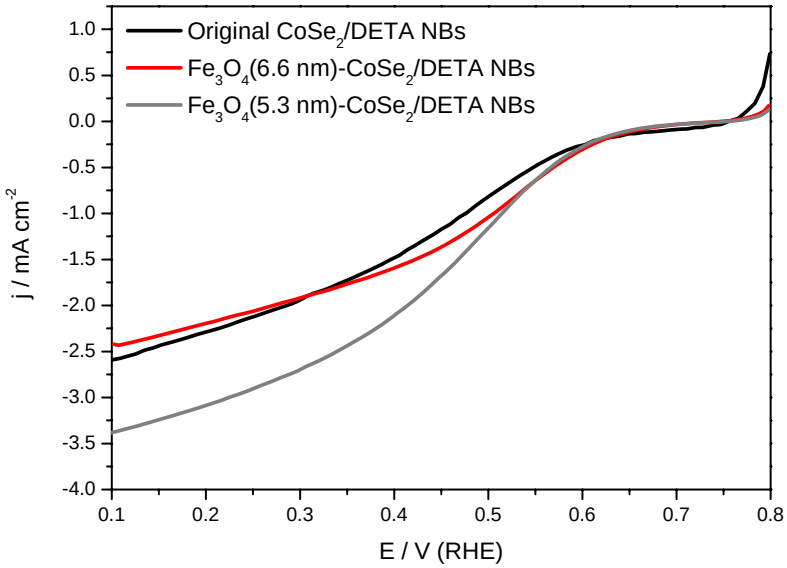

Fig. S8 Polarization curves for the ORR on original $CoSe_2$-DETA nanobelts, 6.6 nm Fe_3O_4 NPs-decorated $CoSe_2$ nanobelts and 5.3 nm Fe_3O_4 NPs-decorated $CoSe_2$ nanobelts recorded at room temperature in an O_2-saturated 0.5 M H_2SO_4 solution with a sweep rate of 10 mV/s and a rotation rate of 1600 rpm. 6.6 nm and 5.3 nm Fe_3O_4 NPs-decorated $CoSe_2$ nanobelts prepared in the presence of 3×10^{-4} mol and 1.5×10^{-4} mol $Fe(acac)_3$, respectively.