Electronic Supplementary Information

Uniform Self-Assembled Magnetite Chains: Facile Synthesis and Magnetic Properties

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Synthesis of the Cobalt chains

1 mmol of $CoCl_2$•$6H_2O$ and 0.6 g of NaOH were dissolved in 40 mL of EG under magnetic stirring. The mixture was transferred into a 50 ml Teflon-lined stainless steel autoclave, sealed and maintained at 200 °C for 10 h. After the reaction, the product was collected by centrifuging and sequentially washing with ethanol and deionized water for several times, and then dried in a vacuum oven at 60 °C for 4 h.

Synthesis of Co (or Cu) doped magnetite chains

1 mmol of $FeCl_3$•$6H_2O$, 0.1 mmol of $CoCl_2$•$6H_2O$ (or $CuCl_2$•$6H_2O$) and 0.6 g of NaOH were dissolved in 40 mL of EG under magnetic stirring. The mixture was transferred into a 50 ml Teflon-lined stainless steel autoclave, sealed and maintained at 200 °C for 10 h. After the reaction, the product was collected by centrifuging and sequentially washing with ethanol and deionized water for several times, and then dried in a vacuum oven at 60 °C for 4 h.

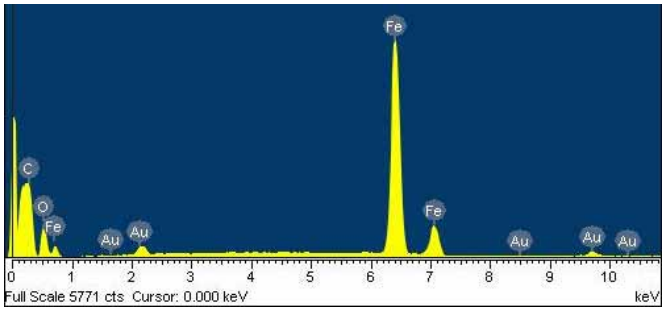


Fig.S1 EDX spectrum of an individual Fe_3O_4 chains. The signals of Au and C are resulted from sputtering of Au and the conducting resin, respectively.

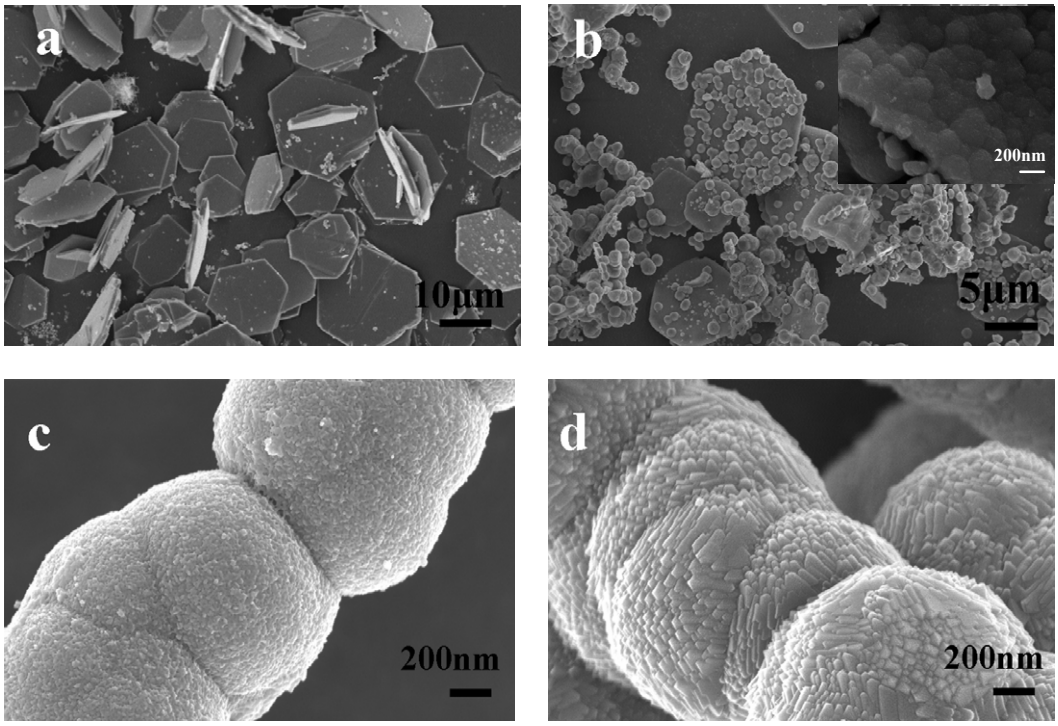
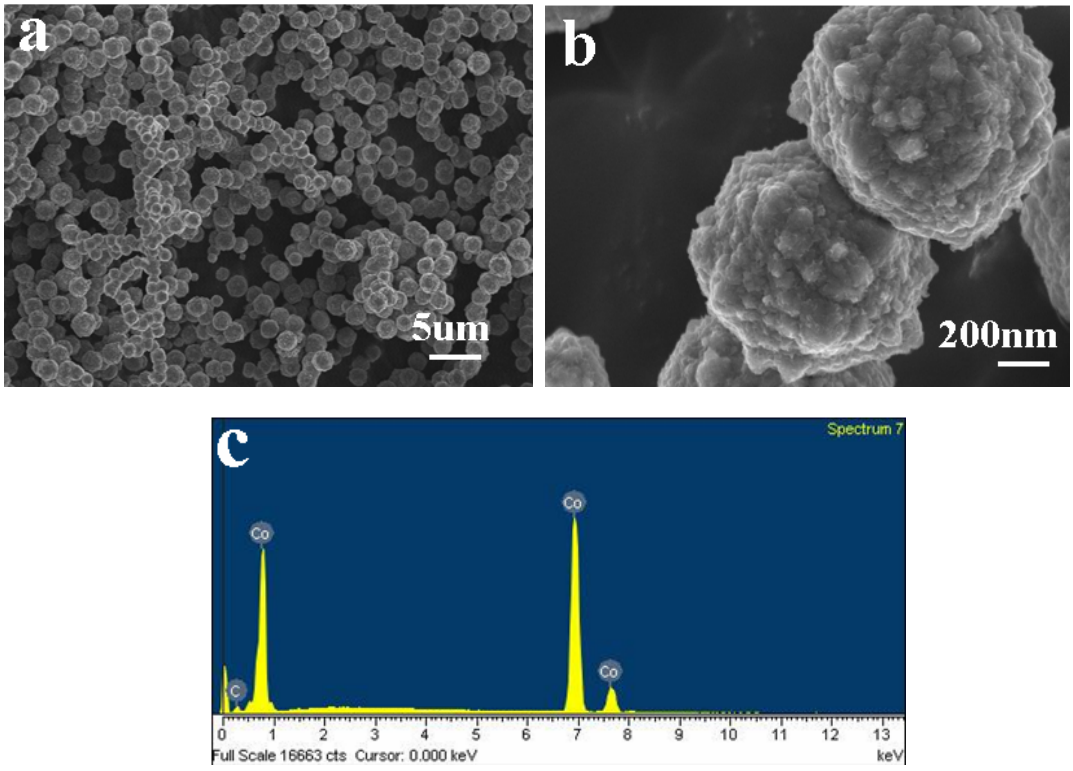


Fig.S2 Morphologies of the products at different reaction times (a) 1 h; (b) 1.5 h; (c) 2 h; (d) 24 h.



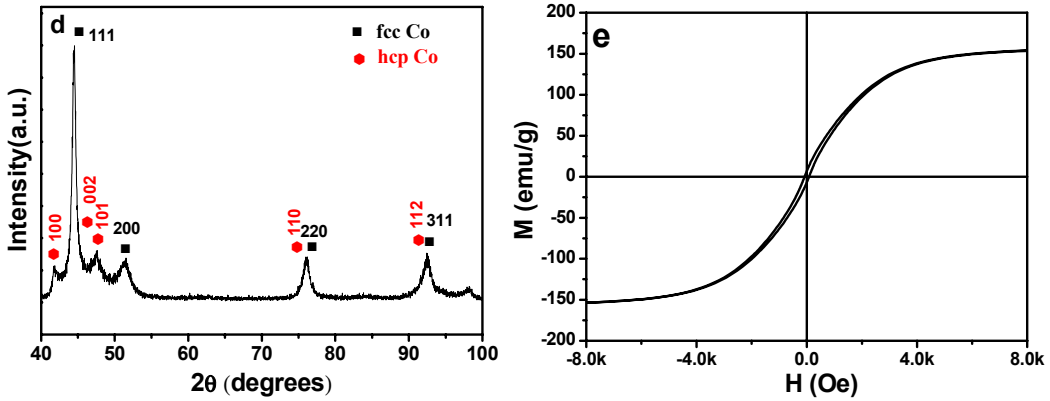
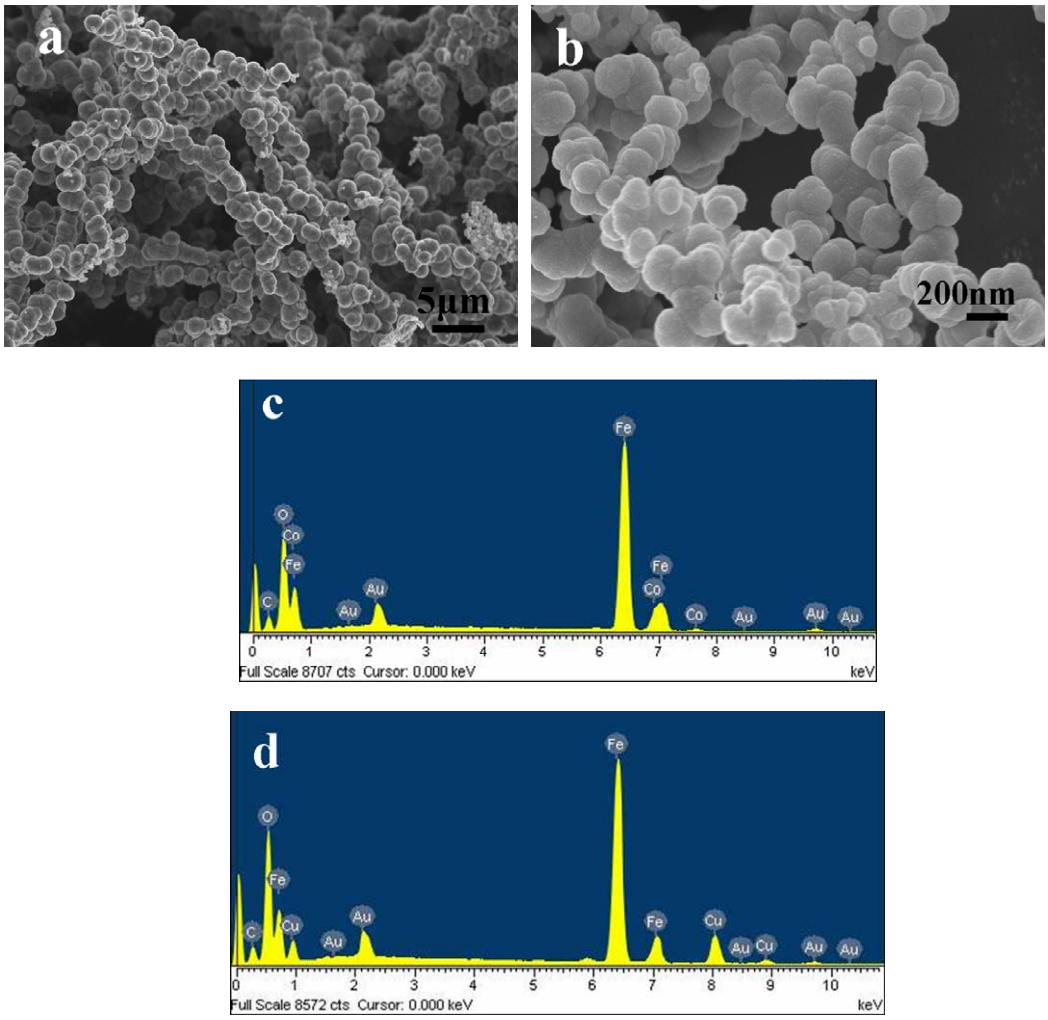


Fig.S3 (a) and (b) SEM images, (c) EDX spectrum, (d) XRD pattern, and (e) room temperature magnetic hysteresis curve of the Co chains. The results showed hierarchically self-assembled structure of the Co chains. The phases of the chain-like structure were the mixed structures of fcc Cobalt (JCPDS 15-0806) and hcp Cobalt (JCPDS 05-0727). Magnetic measurement showed high saturation magnetization value (156.1 emu/g) with the coercivity of 81 Oe.



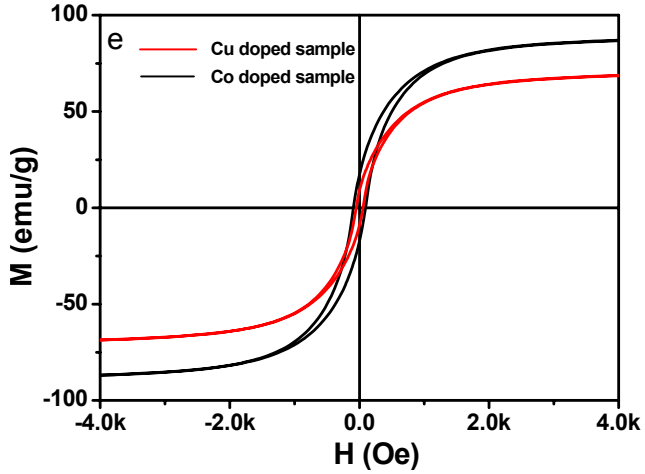


Fig.S4 SEM images of the Fe_3O_4 chains after doping of (a) Co; (b) Cu; EDX analysis of the Fe_3O_4 chains after doping of (c) Co; (d) Cu; (e) Room temperature magnetic hysteresis curves of the doped samples. Experiment results showed that after doping of other elements the products still maintained the chain-like shape. Doping of Cu induced the blocking unit size decreasing from 2 μm to 200 nm in average with a lower saturation magnetization value. While in the case of Co doped sample, the particle size maintained unchanged but the coercivity increased to a large extent (from 57 Oe to 92 Oe) without decreasing the saturation magnetization.