

Supporting Information

A Facile Strategy for the Preparation of Well-Dispersed Bimetal Oxide CuFe_2O_4 Nanoparticles Supported on Mesoporous Silica

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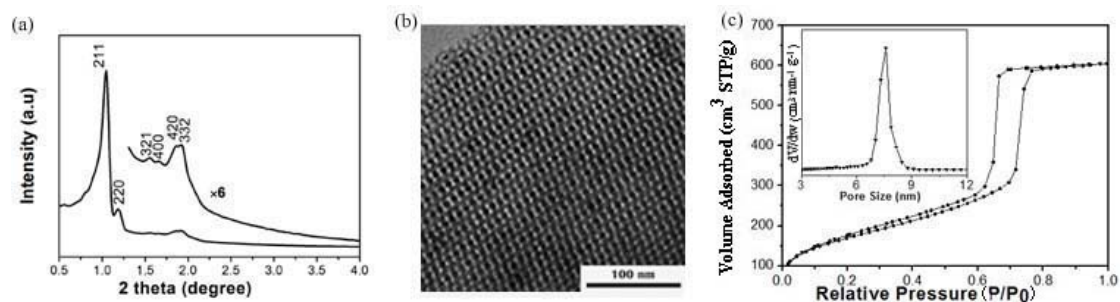


Figure S1. (a) Small angle XRD pattern, (b) TEM image, (c) Nitrogen sorption isotherms, and (c inset) its corresponding pore size distribution curve of the mesoporous silica KIT-6 support.

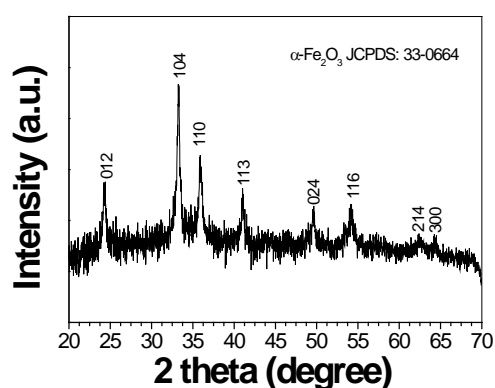


Figure S2. XRD pattern of the red powder form precipitate collected from the homogeneous mixture of iron nitrate and copper nitrate after being heated at 150 °C for 2 h. This result confirms that crystalline $\alpha\text{-Fe}_2\text{O}_3$ can be directly formed from the solution of homogeneously mixed iron and copper nitrate precursors.

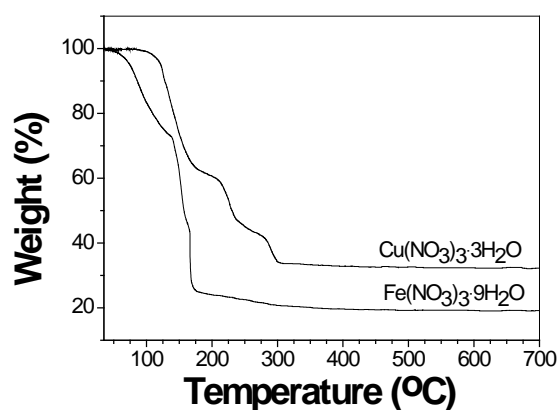


Figure S3. TGA curves of $\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$ and $\text{Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$ recorded under air gas flow (40 mL/min) with a ramp of 15 °C/min. (7.594 mg $\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$ and 8.208 mg $\text{Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$ were separately loaded in an open alumina crucible without any cover for TGA test.)

Table S1. The weight loss of $\text{Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$ and $\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$ after drying at 100 °C for 24 h.

Molecule formula	Origin weight (g)	Weight loss (g)	Weight loss percent %	Theory percent of H_2O %
$\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$	1.094	0.438	40	40
$\text{Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$	0.849	0.209	24.6	22.3

Table S2. Parameters of KIT-6 support and KIT-6 with CuFe_2O_4 particles.

Materials	BET surface area ($\text{m}^2 \text{g}^{-1}$)	Pore size (nm)	Pore Volume ($\text{cm}^3 \text{g}^{-1}$)
KIT-6	599	7.5	0.94
10% loading	411	7.5	0.70
20% loading	335	7.5	0.55
30% loading	387	7.5	0.56

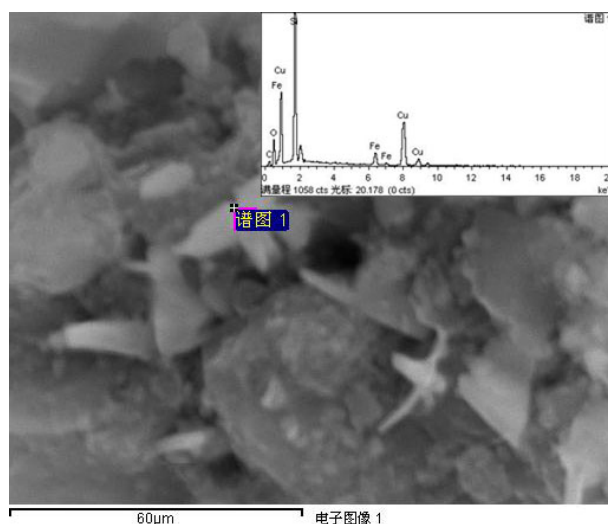


Figure S4. SEM image and EDX spectrum of Sample-W.

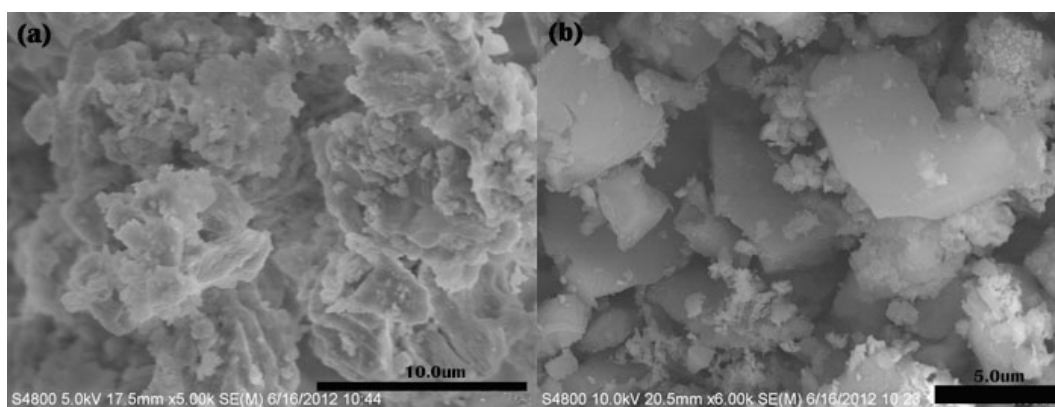


Figure S5. SEM images of the (a) Fe_2O_3 @KIT-6 and (b) CuO @KIT-6 synthesized from $\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$ @KIT-6 and $\text{Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$ @KIT-6, respectively.

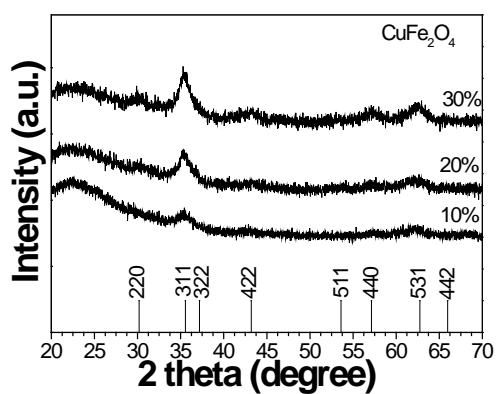


Figure S6. XRD patterns of CuFe_2O_4 with different loading amount.

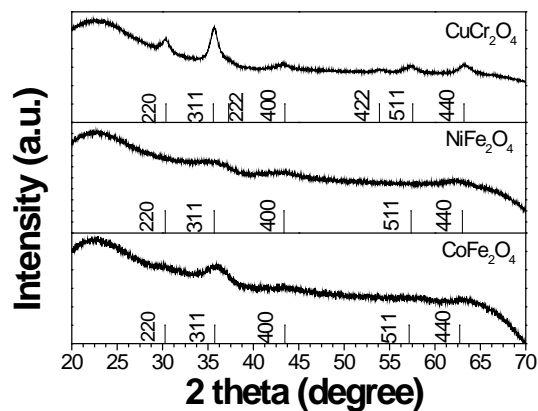


Figure S7. XRD patterns of different bimetallic oxide nanoparticles supported on the mesoporous silica (CuCr_2O_4 : 26-0509, NiFe_2O_4 : 74-2081 and CoFe_2O_4 : 01-1121).

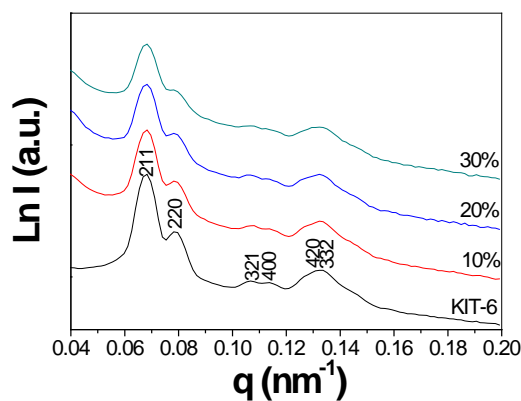


Figure S8. SAXS patterns of KIT-6 and CuFe_2O_4 @KIT-6 with 10 ~ 30 % loading amount.

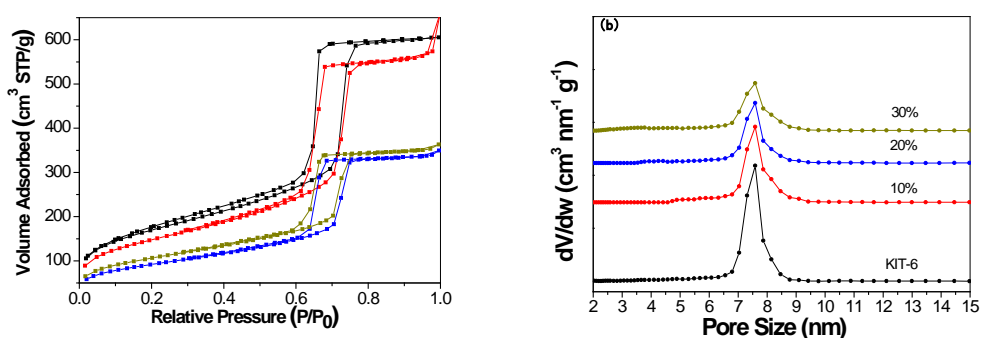


Figure S9. (a) N_2 adsorption-desorption isotherms and (b) their corresponding pore size distribution curves of KIT-6 support and CuFe_2O_4 @KIT-6 samples with different loading amounts. (black line: KIT-6, red line: 10%, blue line: 20%, dark yellow line: 30%).

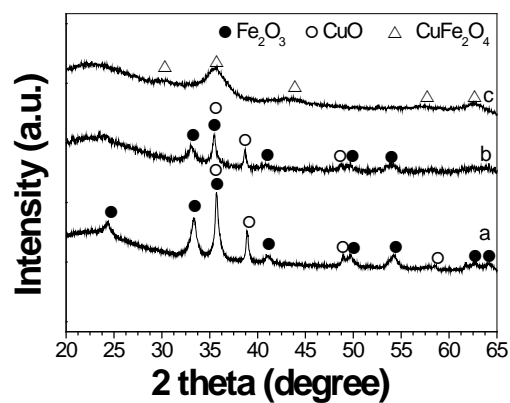


Figure S10. XRD patterns of Sample-W calcined in different conditions: (a) 3 g of nitrate@KIT-6 intermediate calcined inside a 5 mL crucible with a cover, (b) 3 g of nitrate@KIT-6 intermediate calcined inside a 5 mL crucible without cover, (c) 0.5 g of nitrate@KIT-6 intermediate calcined in a petri dish without cover.

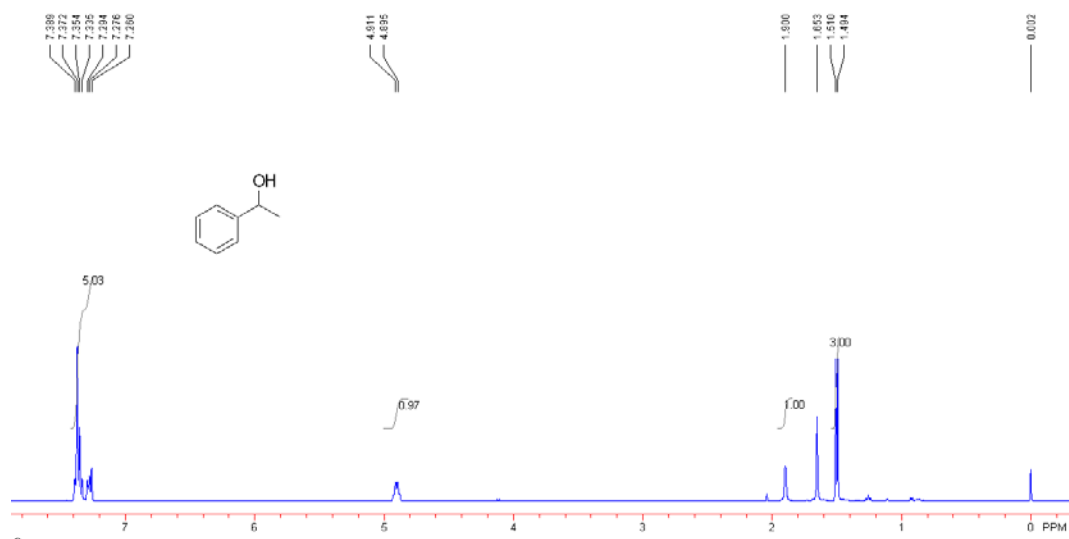


Figure S11. ^1H NMR spectrum of (*S*)-1-phenylethanol.

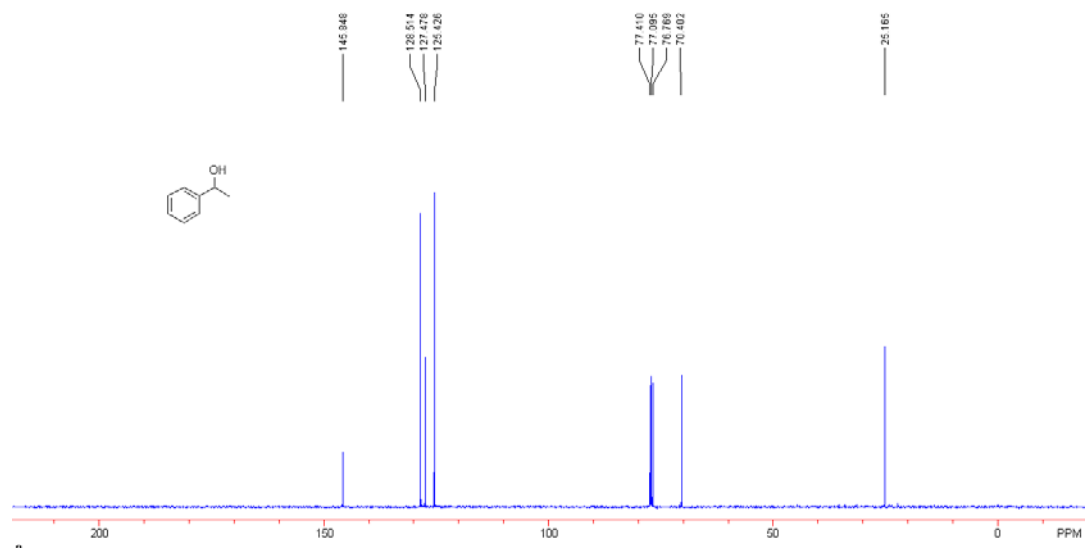
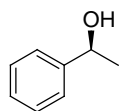
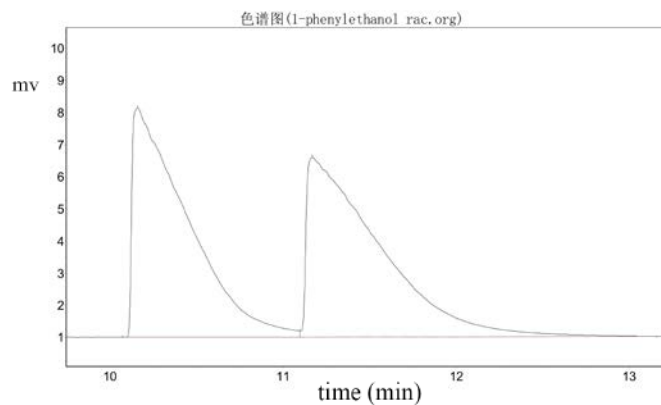


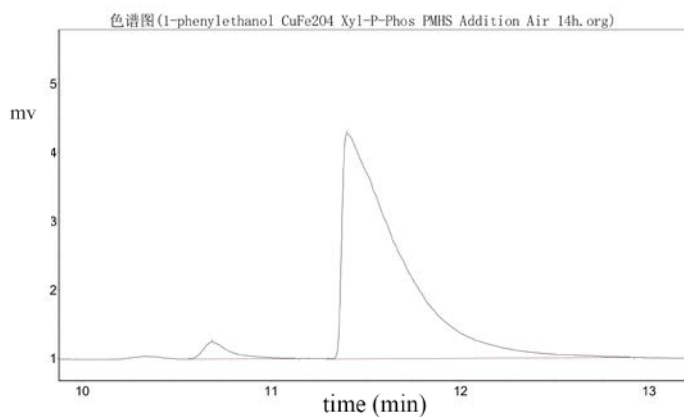
Figure S12. ^{13}C NMR spectrum of (*S*)-1-phenylethanol.



The conversion and ee value were determined by Capillary GC with a 25m × 0.25 mm Chirasil-DEX CB column (Varian, carrier gas, N₂); 115 °C; isothermal; t_R (**1a**) = 4.62 min; t_R (*R*) = 10.16 min; t_R (*S*) = 11.17 min. Chromatograms are illustrated below for a 93% ee sample:



Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	10.160	7135.186	157569.375	49.1491
2	11.168	5587.702	163024.922	50.8508
Totals:		12722.888	320594.297	100.0000



Totals:	RetTime (min)	Height (mv)	Area (mv)	Area (%)
Totals:	10.687	242.752	2460.502	3.4902
	11.402	3276.666	68037.898	96.5098
总计		3519.418	70498.401	100.0000

Figure S13. GC spectra of (*S*)-1-phenylethanol.