Supporting Information

Flower-like RuCu nanodendrites as catalysts for hydrogenation of p-nitrophenol with β-cyclodextrin as promoters

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Cyclodextrin (CD) can form inclusion complexes with various guests including organic molecules, inorganic ions and coordination compounds by weak intermolecular interaction \[^1\]. This molecule has been widely used in homogeneous and heterogeneous catalysis \[^2\].

1. Le Xin Song, Lei Bai, Xiao Min Xu, Jian He, Shu Zhen Pan, Coordination Chemistry Reviews, 2009, 253, 1276–1284.
SFigure 1. EDS result of RuCu nanodendrites.

SFigure 2. XRD patterns of RuCu nanodendrites, metallic Ru and metallic Cu.
SFigure 3. TEM images of RuCu products obtained with RuCl₃·xH₂O and Cu₂O at the ratio of 1:1.

SFigure 4. TEM images of RuCu products obtained with different molar ratio of RuCl₃·xH₂O and CuCl (A) 1:2 and (B) 1:5.
SFigure 5. Successive UV-vis absorption spectra of the reduction of 4-NP by NaBH₄ in the presence of β-CD. No peak around 300 nm was observed, suggesting that no 4-AP was formed.

SFigure 6. TEM images of Ru nanoparticles. (Synthesis: 10 ml ethylene glycol, 30 mg PVP(K-30) and 5 mg RuCl₃·xH₂O at 423 K in an oil bath for 4 h.)
SFigure 7. Metallic Cu obtained by CuCl and oleylamine. (Synthesis: 5 ml oleylamine and 10 mg CuCl at 473 K in an oil bath under stirring for 4 h)

SFigure 8. Successive UV-vis absorption spectra of the reduction of 4-NP by NaBH$_4$ in the presence of (a) Ru nanoparticles and (b) the logarithm of the absorbance at 400 nm vs. reaction time. (2 mg, 22 wt.% Ru by ICP, the other condition is the same as that of RuCu nanodendrites)
Figure 9. Successive UV-vis absorption spectra of the reduction of 4-NP by NaBH₄ in the presence of (a) metallic Cu and (b) the logarithm of the absorbance at 400 nm vs. reaction time. (2 mg, 23 wt.% Cu by ICP, the other condition is the same as that of RuCu nanodendrites)

Figure 10. Successive UV-vis absorption spectra of the reduction of 4-NP by NaBH₄ in the presence of (a) physical mixtures Ru nanoparticles as well as metallic Cu and (b) the logarithm of the absorbance at 400 nm vs. reaction time. (2 mg Cu catalyst and 2 mg Ru catalyst, the other condition is the same as that of RuCu nanodendrites)