Supporting Information

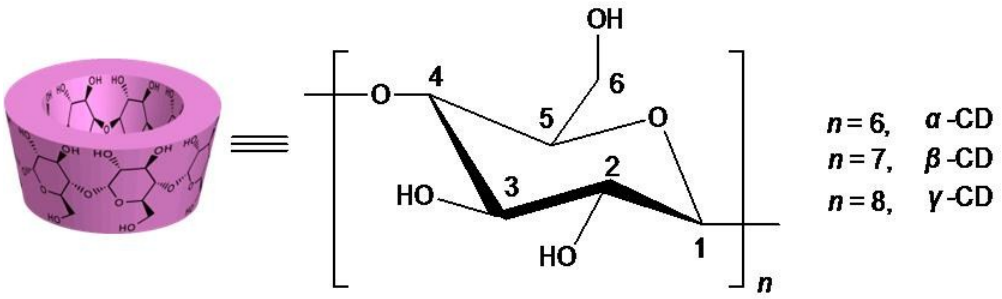
Flower-like RuCu nanodendrites as catalysts for hydrogenation of *p*-nitrophenol with *β*-cyclodextrin as promoters

Lei Bai[†‡]

†. College of Chemistry and Materials Engineering, Anhui Science and Technology University, Donghua Road, Fengyang, Eastern Bengbu, Anhui, China, 233100

‡. Centre of Advanced Nanocatalysis, Department of Chemistry, University of Science and Technology of China, Hefei, 230026, Anhui, China.

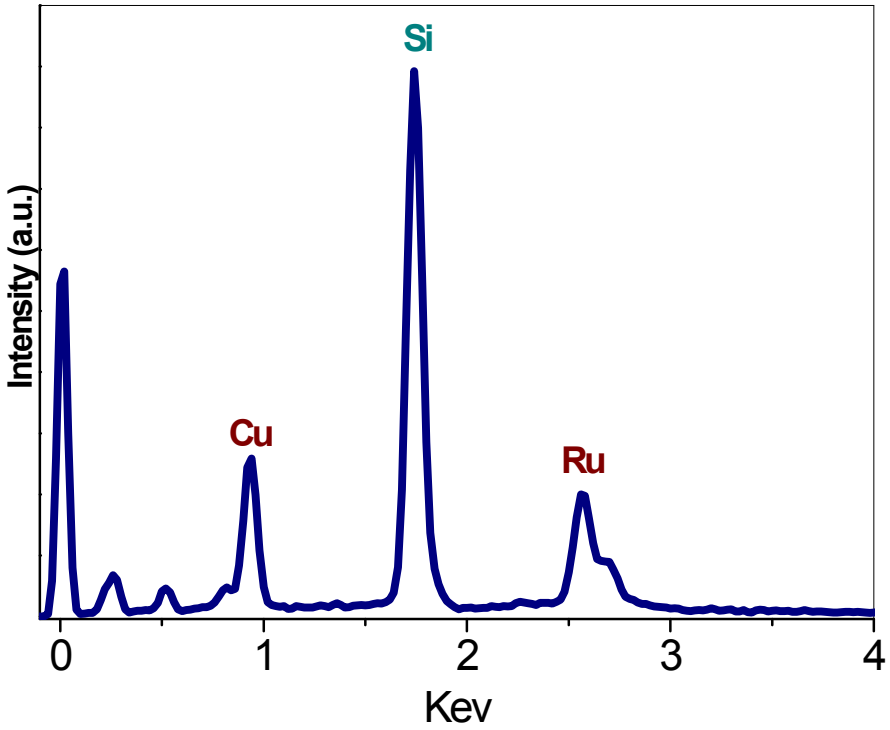
Email: baileiwj2014@163.com; leibai@ustc.edu.cn



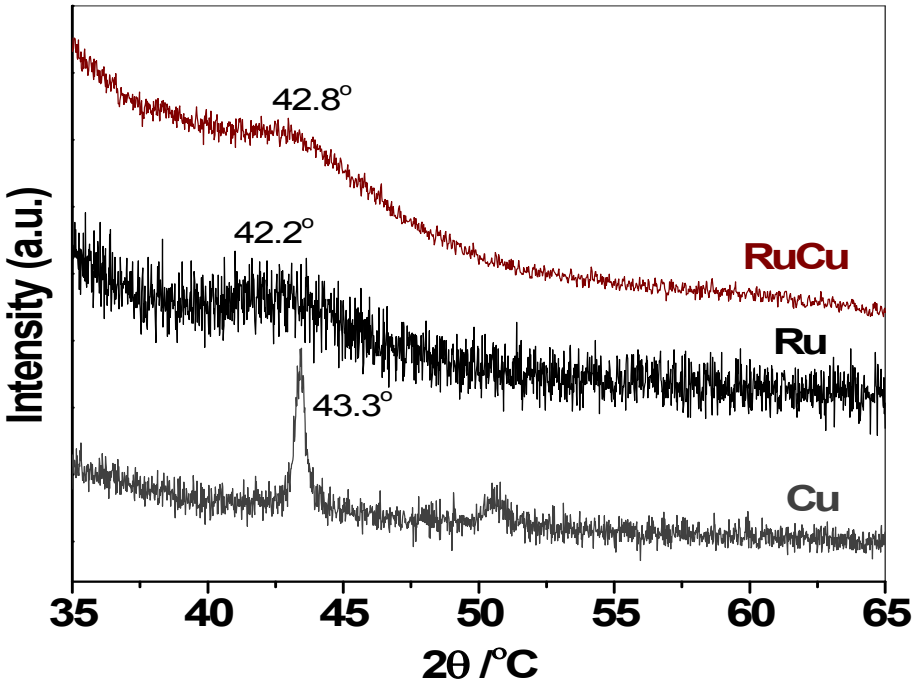
Scheme 1. Illustration of cyclodextrin.

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].

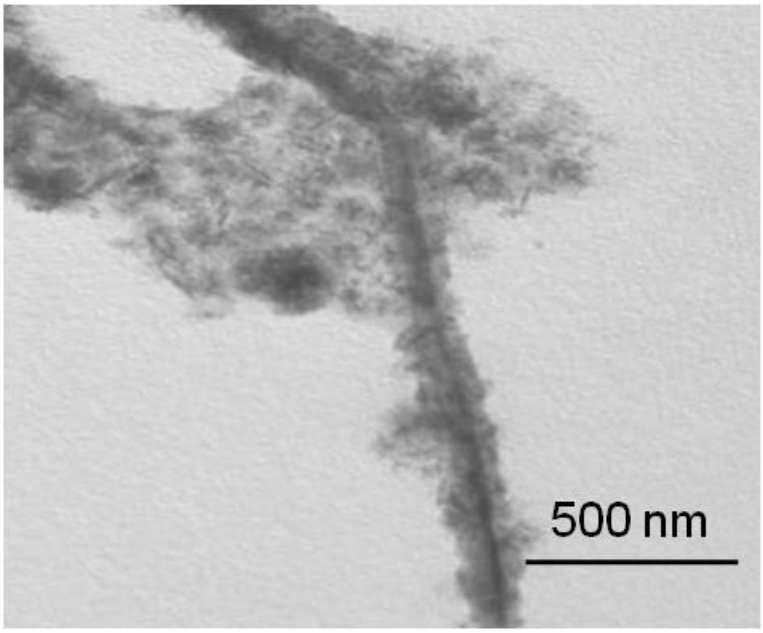
1. Le Xin Song, Lei Bai, Xiao Min Xu, Jian He, Shu Zhen Pan, Coordination Chemistry Reviews, 2009, 253, 1276–1284.
2. F. Hapiot, A. Ponchel, S. Tilloy, E. Monflier, Comptes Rendus Chimie, 2011, 14, 149–166.



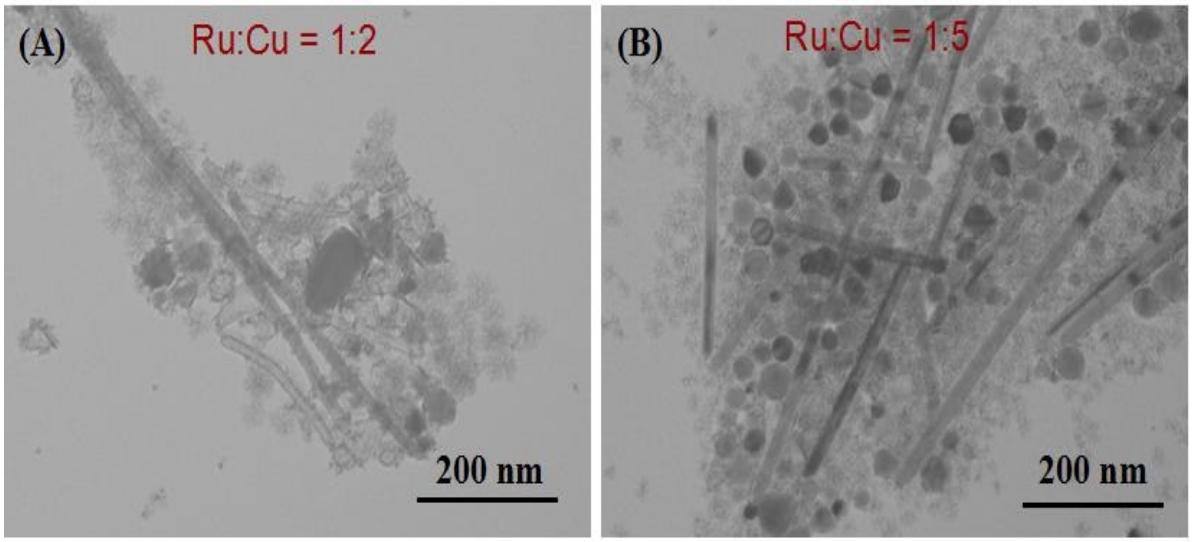
SFigure 1. EDS result of RuCu nanodendrites.



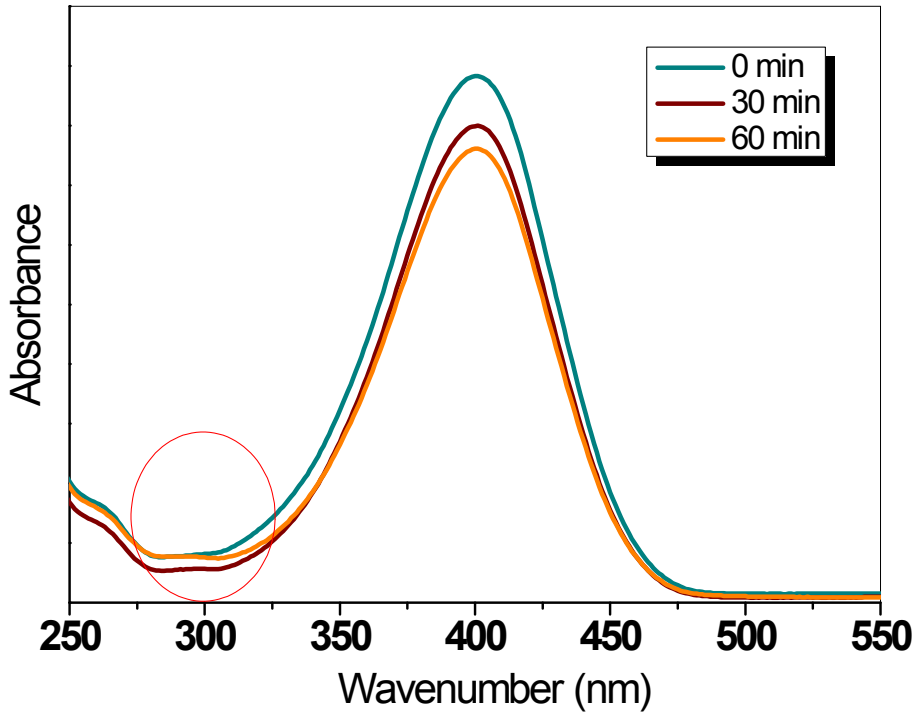
SFigure 2. XRD patterns of RuCu nanodendrites, metallic Ru and metallic Cu.



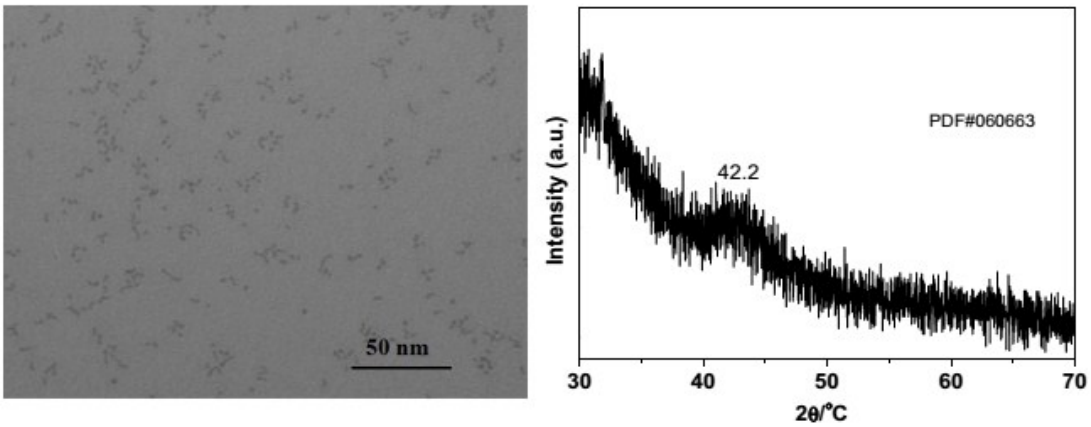
SFigure 3. TEM images of RuCu products obtained with $RuCl_3 \cdot xH_2O$ and Cu_2O at the ratio of 1:1.



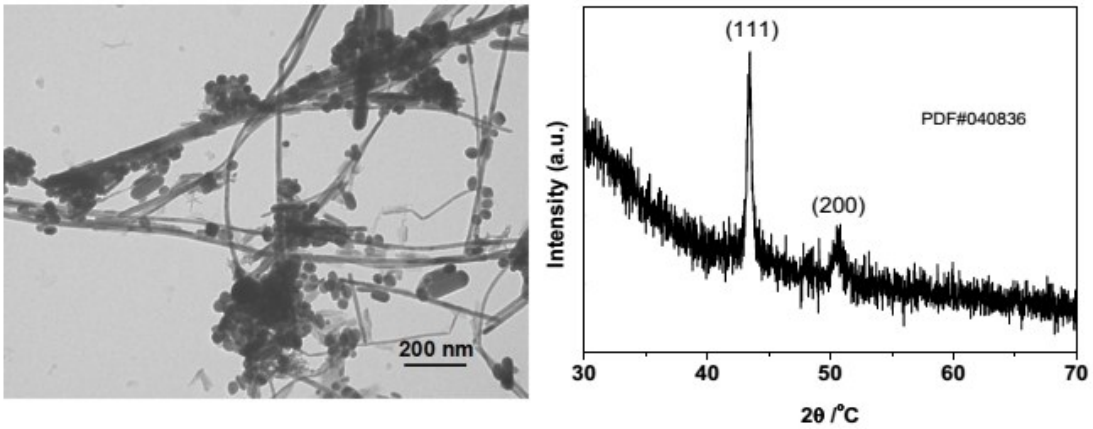
SFigure 4. TEM images of RuCu products obtained with different molar ratio of $RuCl_3 \cdot xH_2O$ and CuCl (A) 1:2 and (B) 1:5.



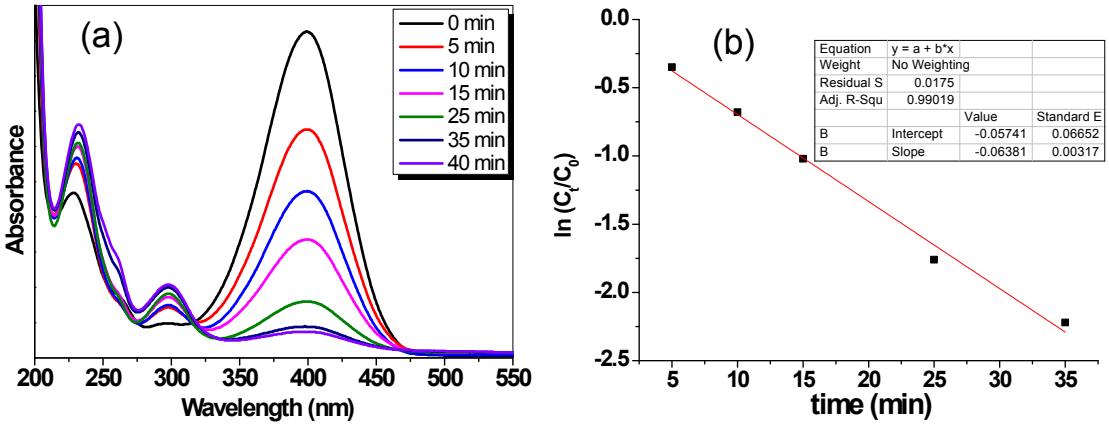
SFigure 5. Successive UV-vis absorption spectra of the reduction of 4-NP by $NaBH_4$ in the presence of β-CD. No peak around 300 nm was observed, suggesting that no 4-AP was formed.



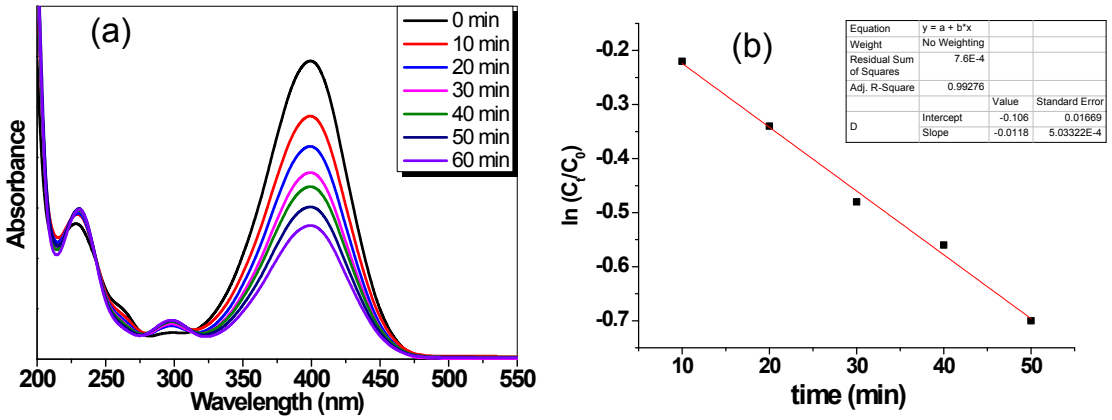
SFigure 6. TEM images of Ru nanoparticles. (Synthesis: 10 ml ethylene glycol, 30 mg PVP(K-30) and 5 mg $RuCl_3 \cdot xH_2O$ at 423 K in an oil bath for 4 h.)



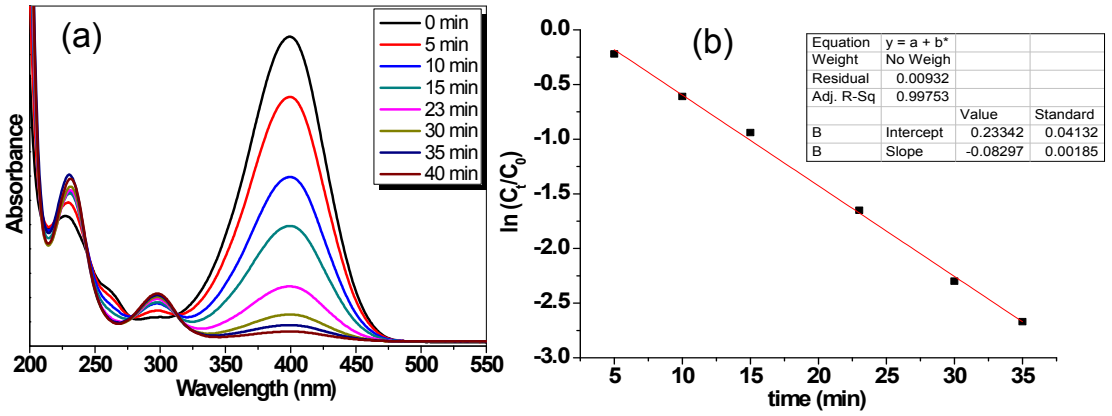
SFigure 7. Metallic Cu obtained by CuCl and oleylamine. (Synthesis: 5 ml oleylamine and 10 mg CuCl at 473 K in an oil bath under stirring for 4 h)



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)



RFigure 9. Successive UV-vis absorption spectra of the reduction of 4-NP by $NaBH_4$ 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)



SFigure 10. Successive UV-vis absorption spectra of the reduction of 4-NP by $NaBH_4$ 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)