

Supporting Information

Enhancing Catalytic Activity of Ru NPs Deposited with Carbon Species in Yolk-shell Nanostructures

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Table S1. H₂ chemisorption capacity of Ru@C@YSN-T.

Samples	H ₂ uptake ($\mu\text{mol/g}$)	Dispersion (%)
Ru@C@YSN-150	10.9	8.9
Ru@C@YSN-200	27.2	19.9
Ru@C@YSN-500	30.4	21.3

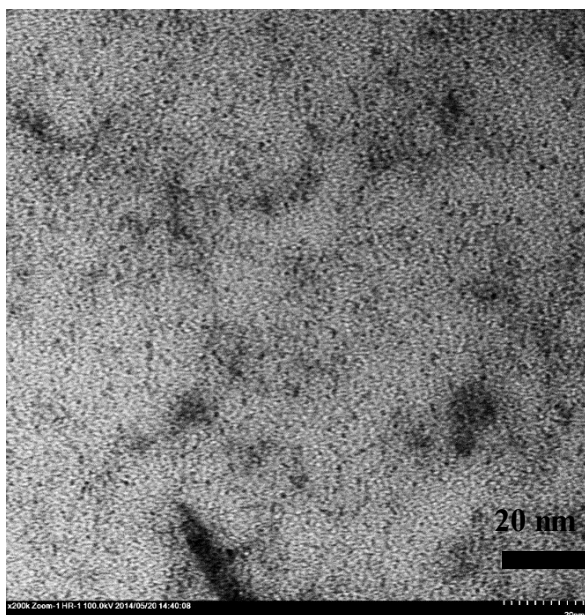


Figure S1. TEM image of PAMAM-G4-OH stabilized Ru NPs (PA-Ru).

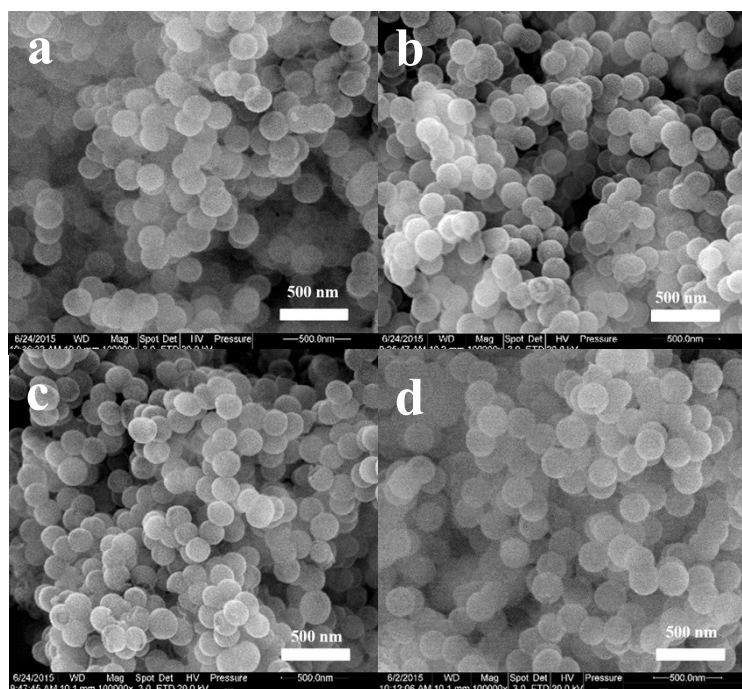


Figure. S2. SEM images of (a) PA-Ru@YSN, (b) Ru@C@YSN-150, (c) Ru@C@YSN-200 and (d) Ru@C@YSN-500.

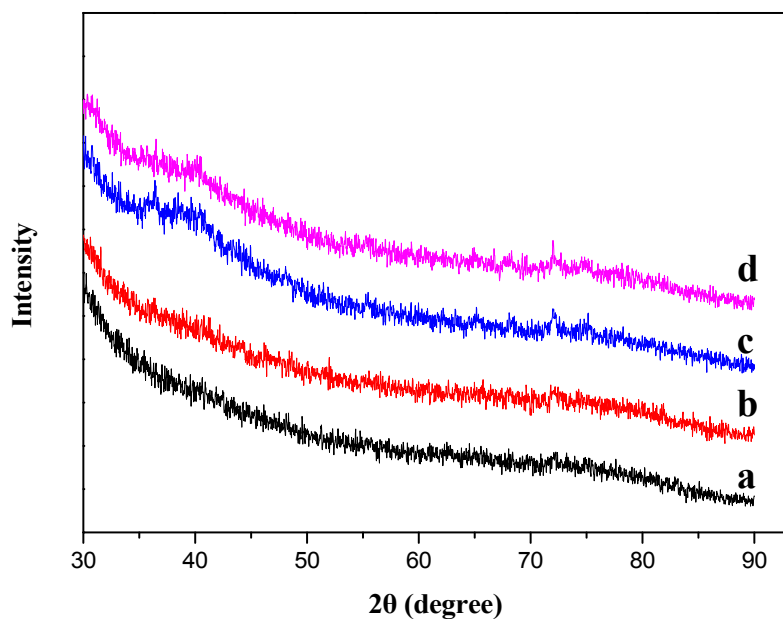


Figure S3. Wide angle XRD patterns of (a) PA-Ru@YSN, (b) Ru@C@YSN-150, (c) Ru@C@YSN-200 and (d) Ru@C@YSN-500.

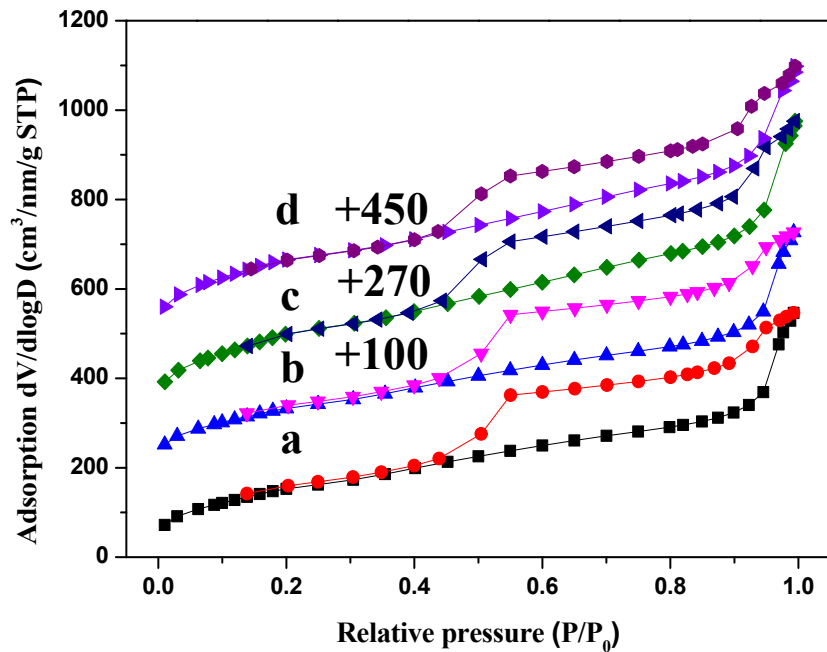


Figure S4. N₂ sorption isotherms and of (a) PA-Ru@YSN, (b) Ru@C@YSN-150, (c) Ru@C@YSN-200 and (d) Ru@C@YSN-500.

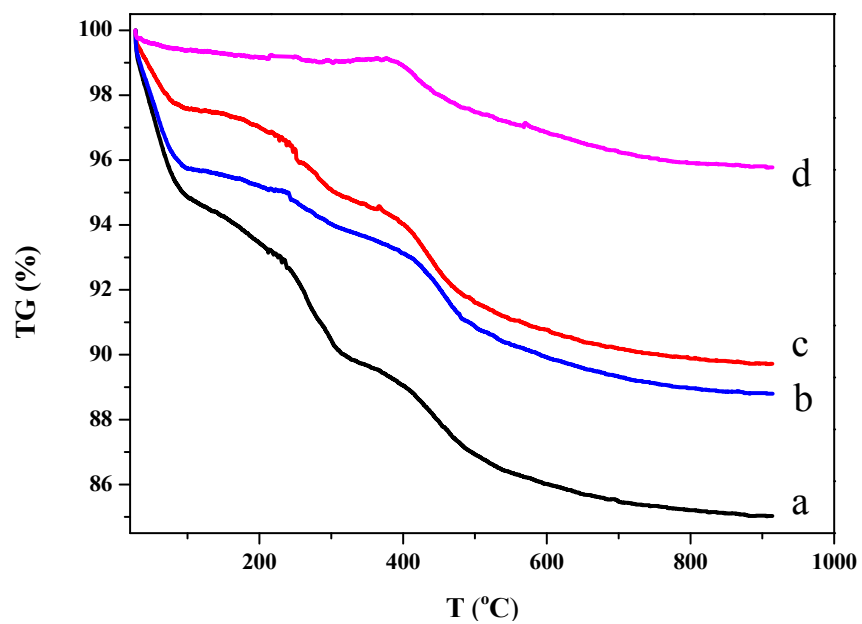


Figure S5. Thermogravimetric analysis curves of (a) PA-Ru@YSN, (b) Ru@C@YSN-150, (c) Ru@C@YSN-200 and (d) Ru@C@YSN-500.

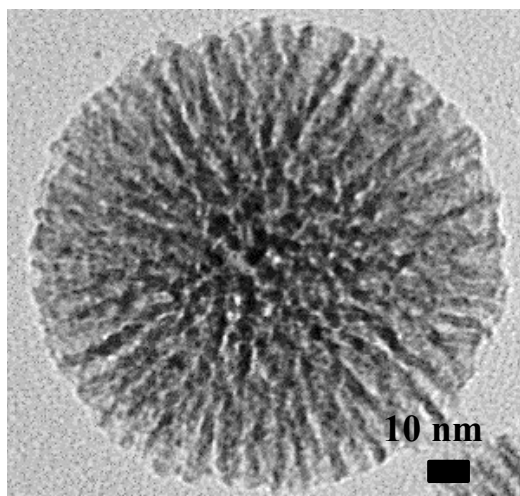


Figure S6. TEM image of Ru@C/SiO₂-500 (typically XPS test sample).

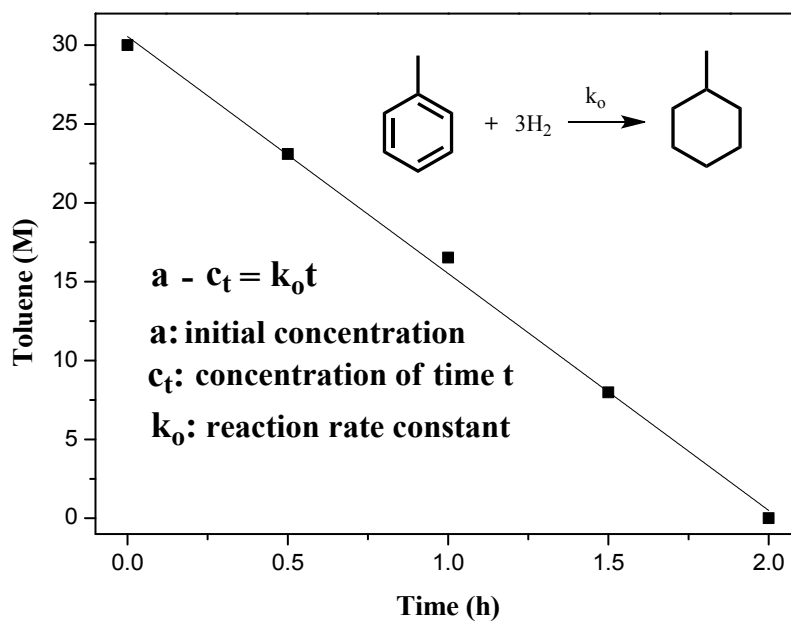


Figure S7. Graph of toluene consumption versus time at the condition of 50 °C, 2Mpa H₂, S/C=10000 by Ru@C@YSN-200.

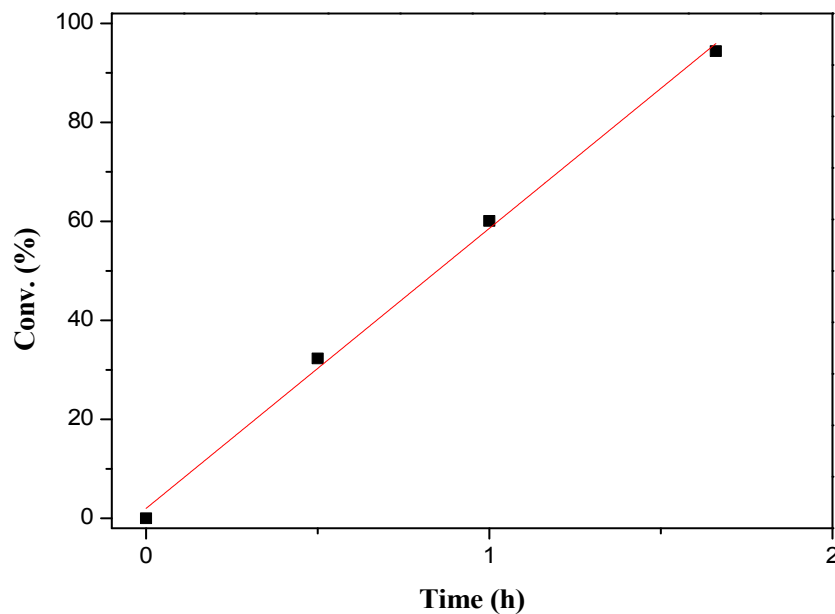


Figure S8. Catalytic hydrogenation of toluene at S/C=35800, P=3 MPa H₂, 100 °C by Ru@C@YSN-500.

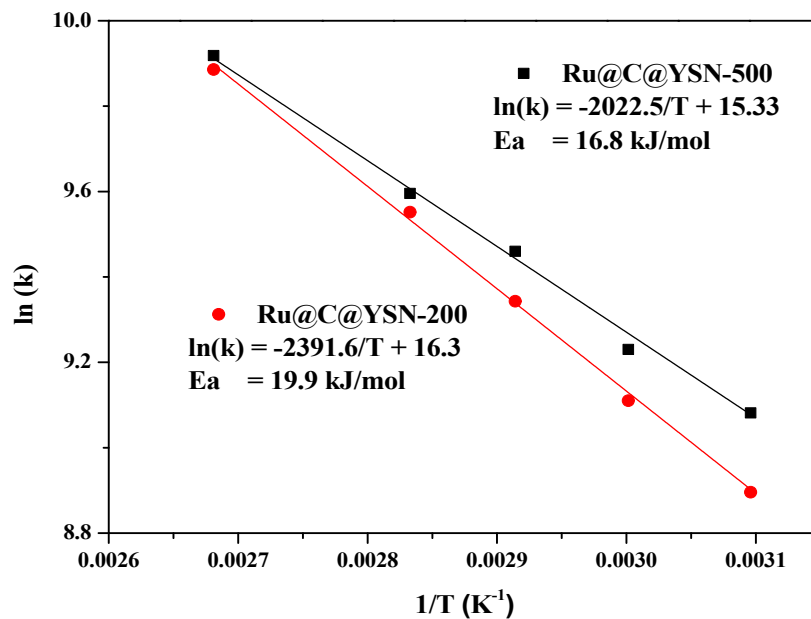


Figure S9. Arrhenius plots of $\ln k$ vs. $1/T$ for Ru@C@YSN-200 , Ru@C@YSN-500 and Ru/C in toluene hydrogenation (reaction conditions: $P=3 \text{ Mpa H}_2$, $S/C=35800$).

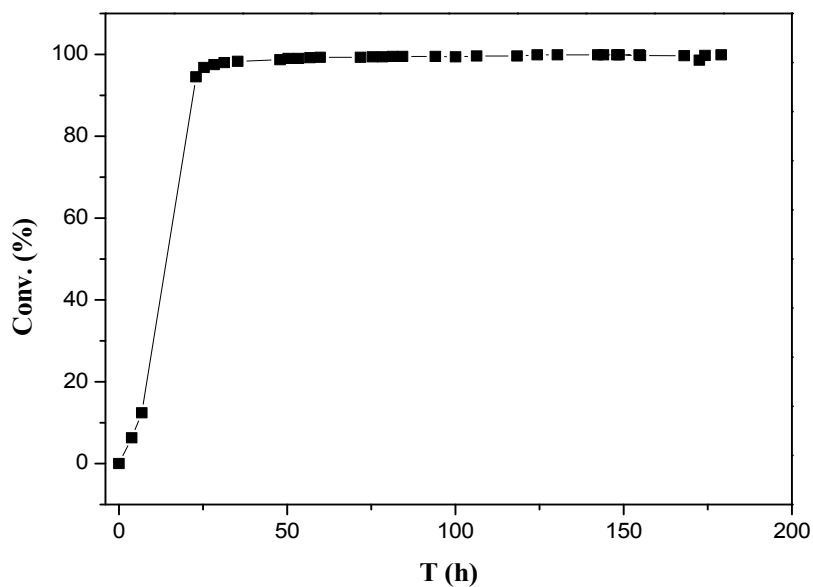


Figure S10. Catalytic hydrogenation of toluene by Ru@C@YSN-200 catalyst in the fixed-bed experiment.