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Supplementary information

Magnetic Yolk-Shell Mesoporous Silica Microspheres with Supported Au Nanoparticles as Recyclable High-Performance Nanocatalysts

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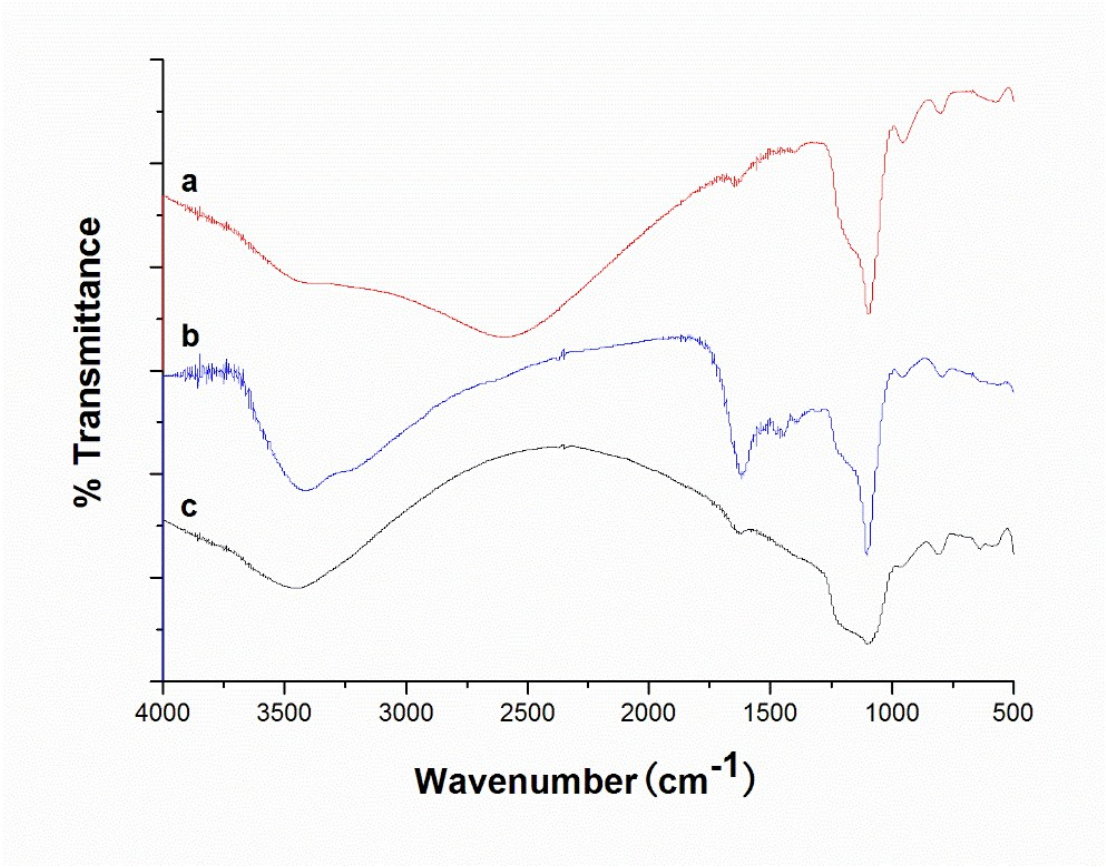

Figure S1. The FT-IR spectra of (a) Fe_3O_4@SiO_2, (b) Fe_3O_4@SiO_2@RF, and (c) Fe_3O_4@SiO_2@hollow *m*SiO_2 (YS-320) after the calcination in air at 550 ºC for 5 h. For the Fe_3O_4@SiO_2@RF, the bands observed at 1460-1480 cm^{-1} and 1620 cm^{-1} attributed to the $–CH_2-$ group and the aromatic group of resorcinol-formaldehyde resins, respectively. After calcinations at 550 ºC for 5 h in air, the adsorption peaks of RF resins almost disappeared for the Fe_3O_4@SiO_2@hollow *m*SiO_2 microspheres, suggesting that the RF resin was completely removed.

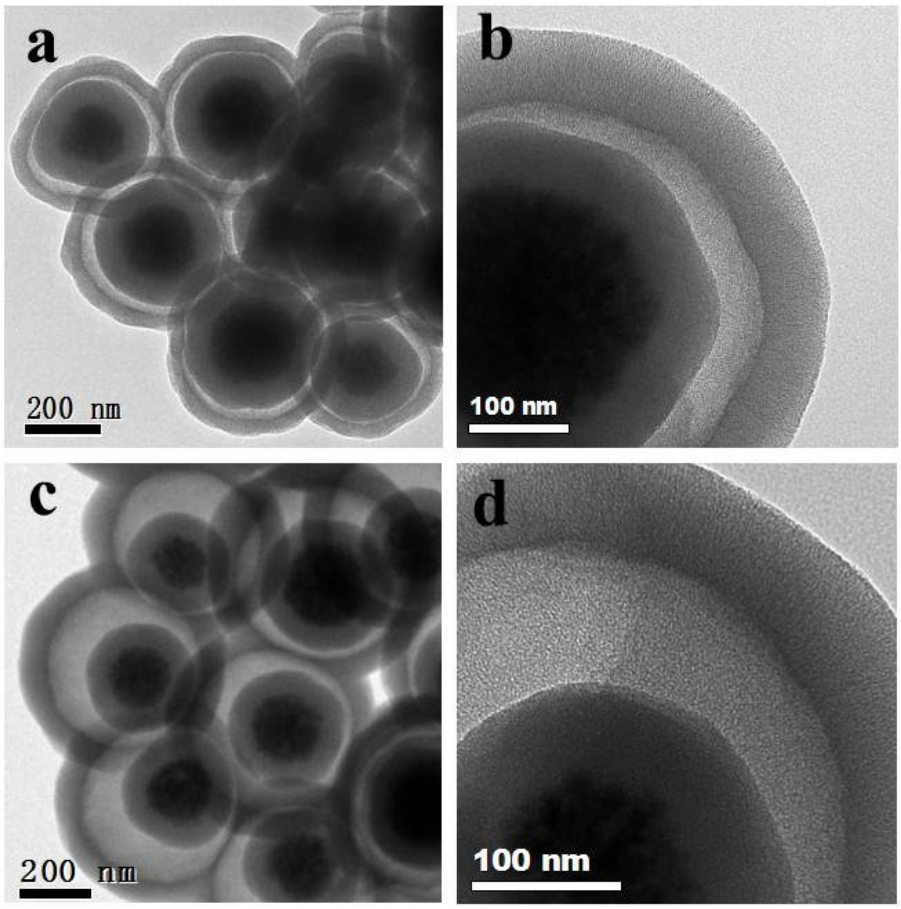

Figure S2. TEM images of the yolk-shell structured Fe_3O_4@SiO_2@hollow mSiO_2 microspheres (a, b) YS-370 and (c, d) YS-430 with different hollow space size of 370 and 160 nm and 430 nm, respectively.

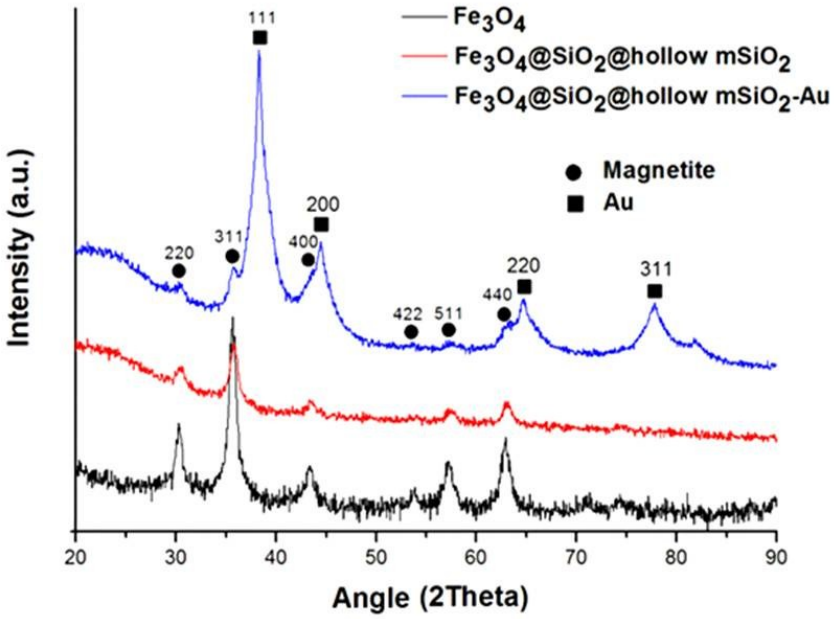

Figure S3. Wide-angle XRD patterns of Fe_3O_4 particles, YS-320 and Fe_3O_4@SiO_2@hollow mSiO_2-Au microspheres (YS-320-Au).

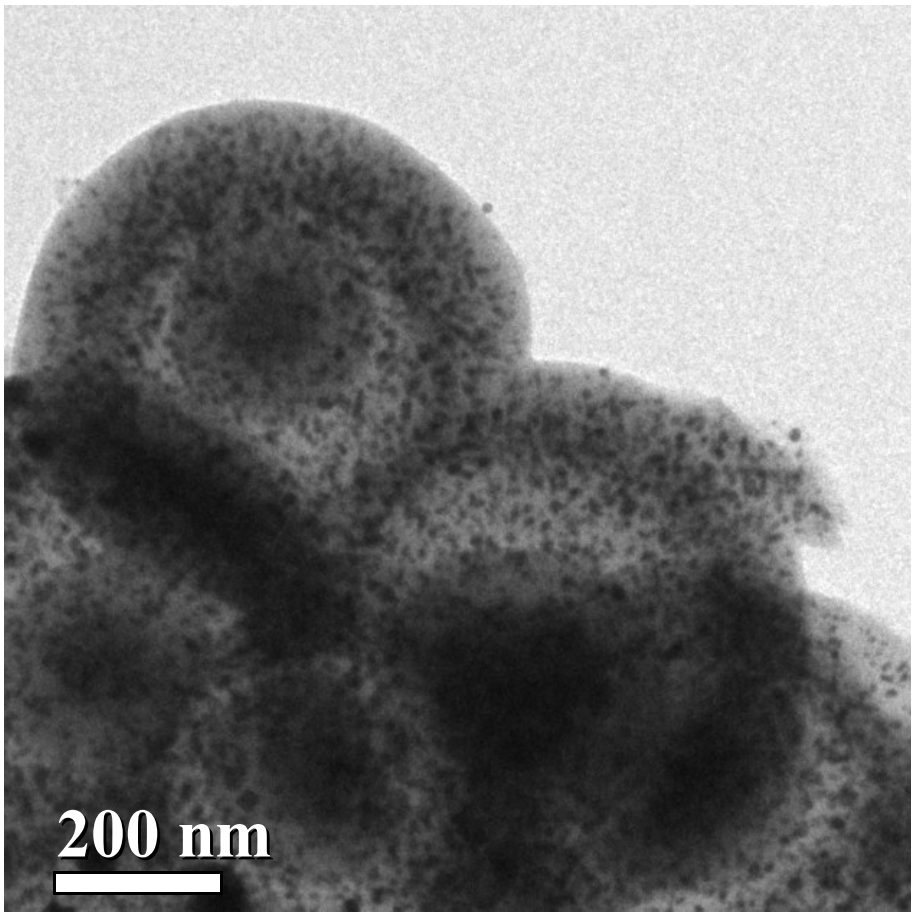

Figure S4. TEM image of the recycled YS-430-Au catalysts after catalyzing the styrene epoxidation for 12 times