Supplementary Information

Ag–Fe_3O_4 Nanocomposites@Chitin Microspheres Constructed by in Situ One-pot Synthesis for Rapid Hydrogenation Catalysis

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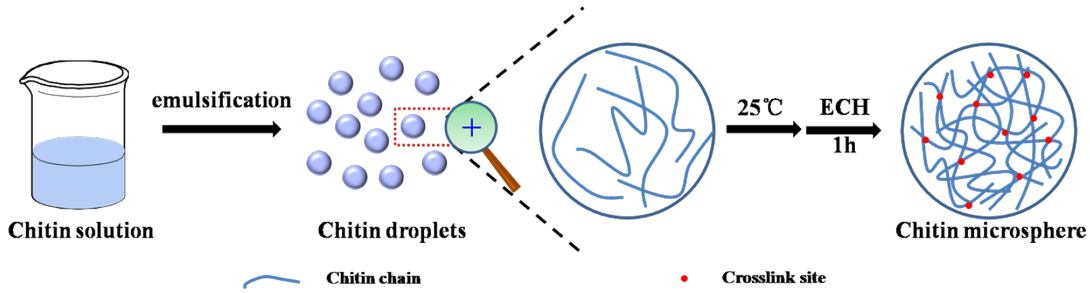
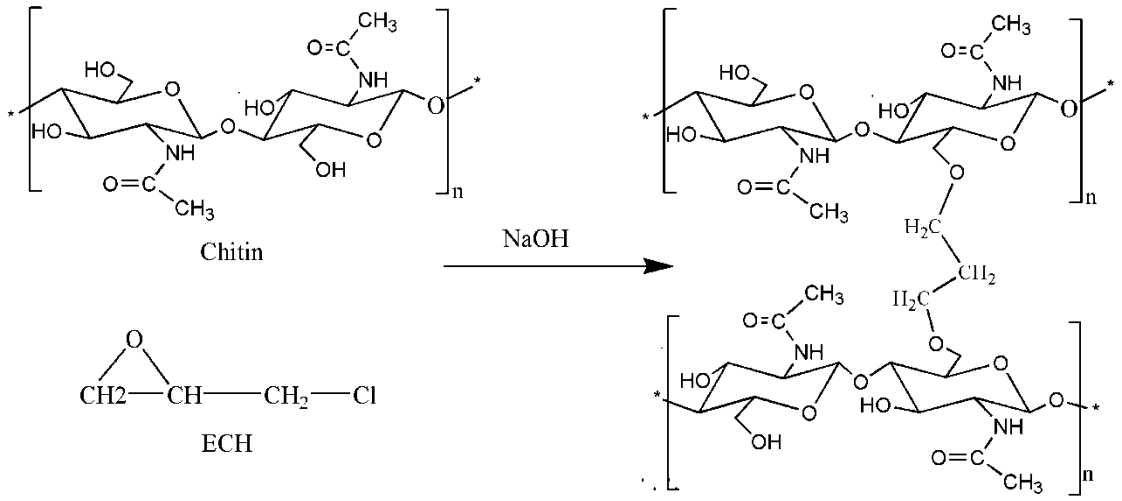
(L. Zhang).



Scheme S1 Schematic preparation of the chitin microspheres.



Scheme S2 Cross-linking reaction of chitin microspheres.

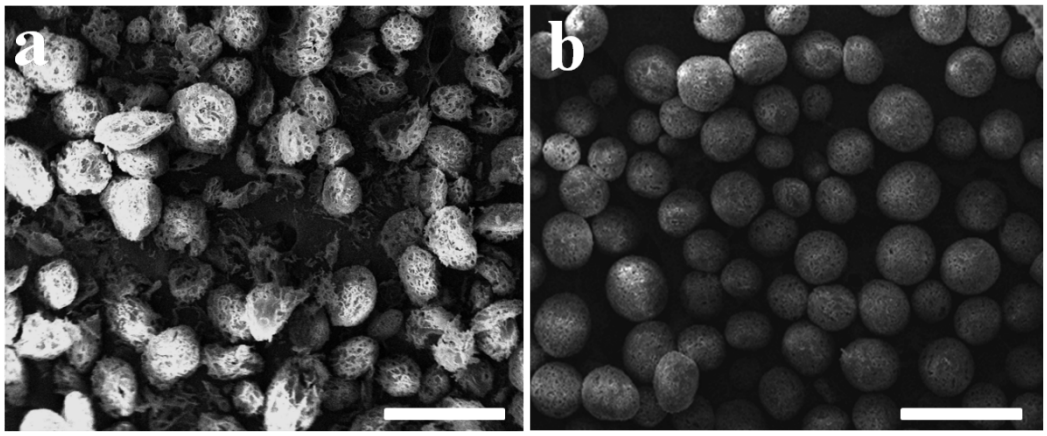


Fig. S1 SEM images of the chitin microspheres regenerated with heating (a) and crosslinked with ECH after heating regeneration (b), the scale bar is 500 μm.

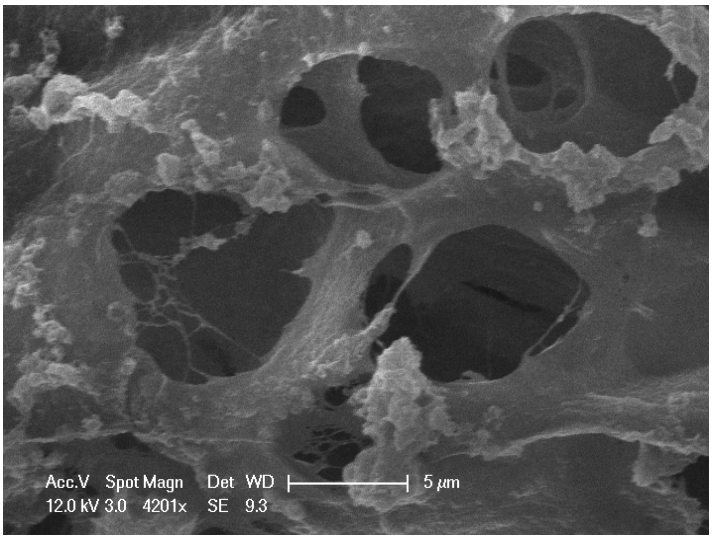


Fig. S2 SEM image of the surface of the chitin microspheres

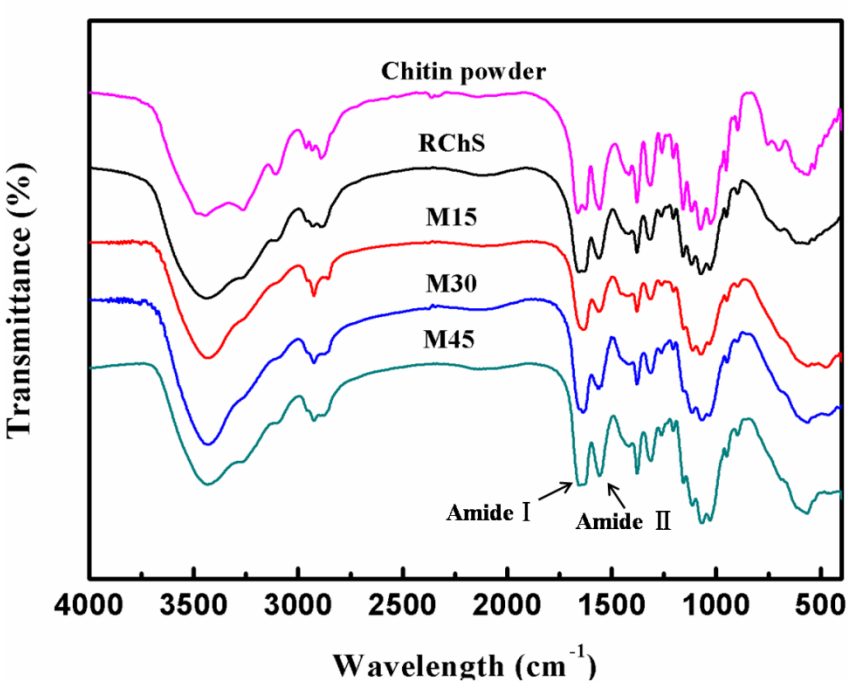


Fig. S3 FTIR spectra of chitin powder, RChS, and magnetic microspheres of M15, M30 and M45.

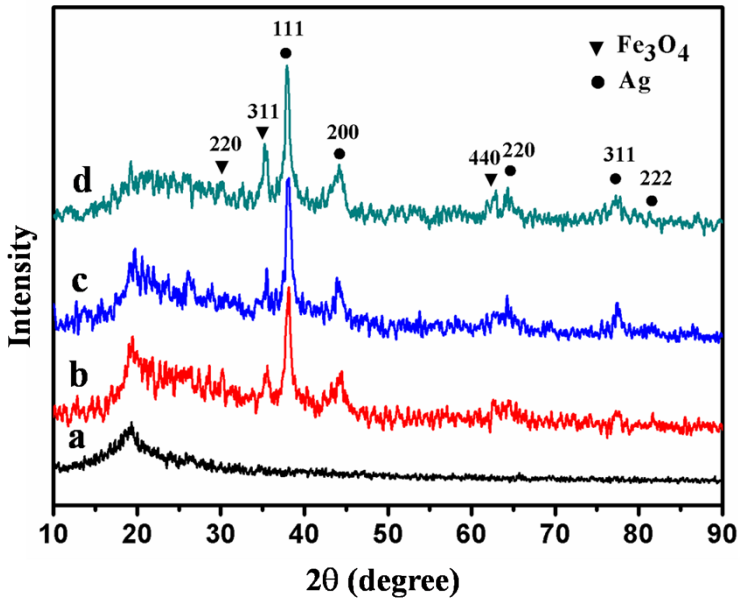


Fig. S4 XRD spectra of RChS (a), M15 (b), M30 (c) and M45 (d)

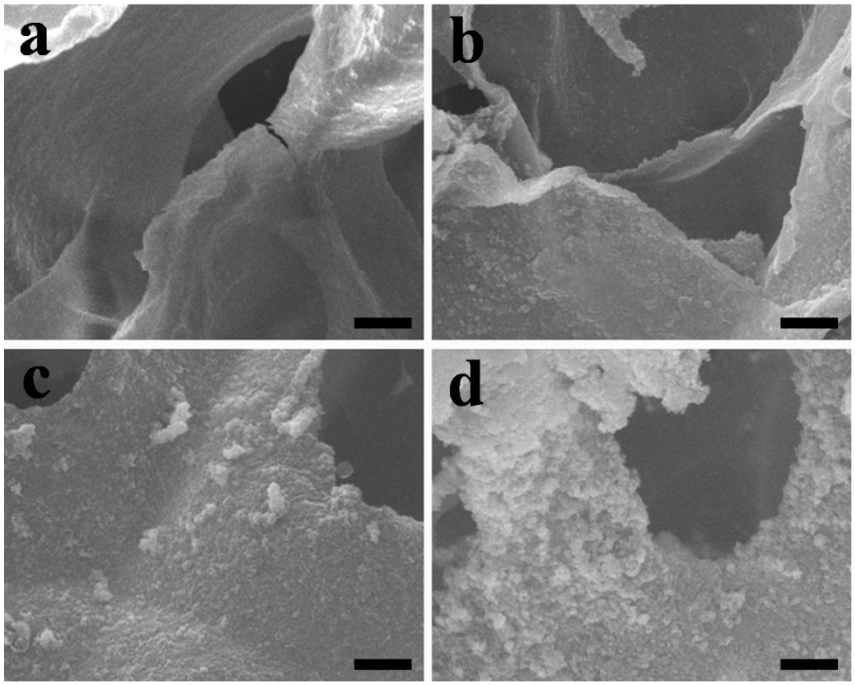


Fig. S5 SEM images of the surfaces of the RChS (a), M15 (b), M30 (c) and M45 (d).

The scale bar is 2 μm.

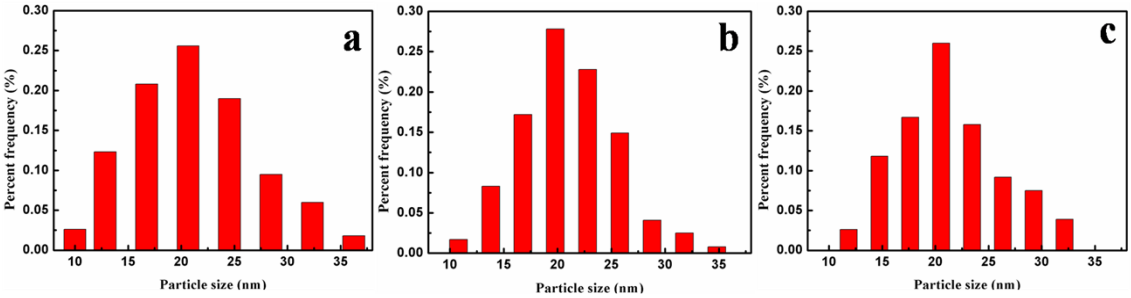


Fig. S6 Size distribution of Ag-Fe_3O_4 nanoparticles in M15 (a), M30 (b) and M45 (c).

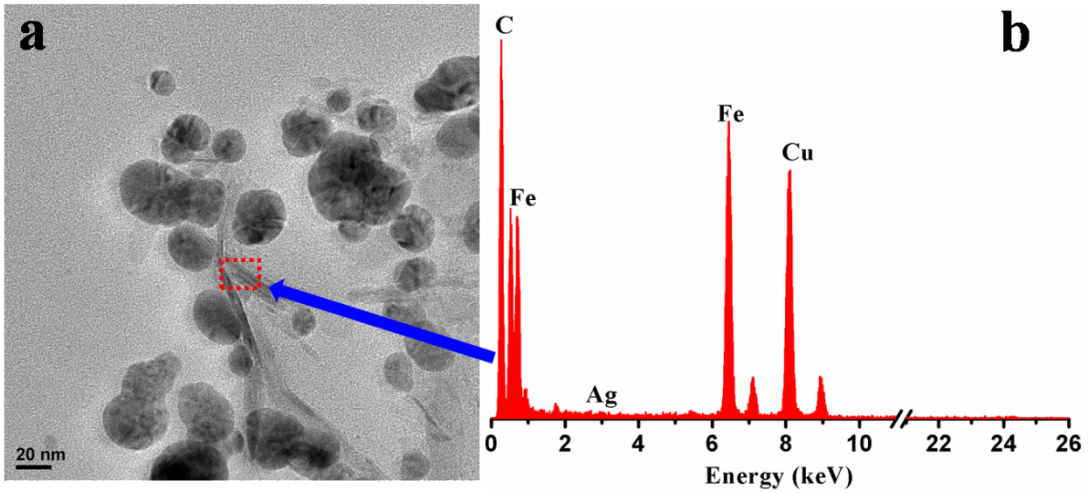


Fig. S7 TEM (a) and EDS (b) spectrum of the selected area.

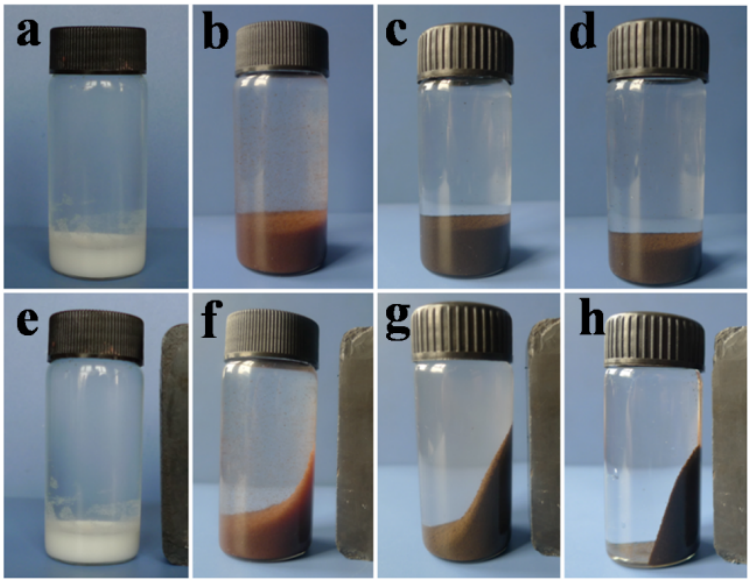


Fig. S8 Photographs of RChS, M15, M30 and M45 (a–d) in water and RChS, M15, M30 and M45 (e–h) under a magnetic field.

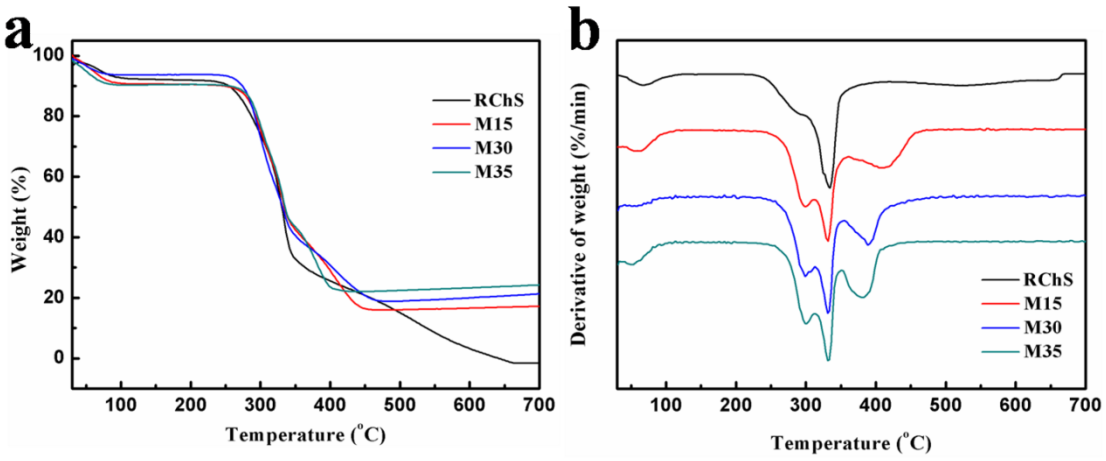


Fig. S9 TGA (a) and DTG (b) curves of RChS, M15, M30 and M45.

Fig. S9 shows the TGA and DTG of RChS and MRChS (M15, M30 and M45) under air. In all TGA curves, the small weight loses around 8% below 150 ℃ apparently resulted from evaporation of adsorbed water. In TGA of RChS, the decomposition of chitin microspheres is split into two stages. The first stages at 230-350 ℃ is carbonization of chitin and the second stage at 360-660 ℃ were ascribed to the oxidation of the burning of the char. The RChS were decomposed completely at 660 ℃, and the M15, M30, M45 gave char yield of 18.0, 20.8 and 22.5%, which should be the content of Ag-Fe_3O_4 nanocomposites in MRChS. It was worth noting that the Ag nanoparticles might be oxidized to the silver oxide with some content. As a consequent, the corresponding peak around 298 ℃ was resulted from the decomposition of silver oxide (Fig. S7).[1] The accelerated burning of the char carbon can be explained by the catalytic efficient of Ag-Fe_3O_4 nanocomposites.[2]

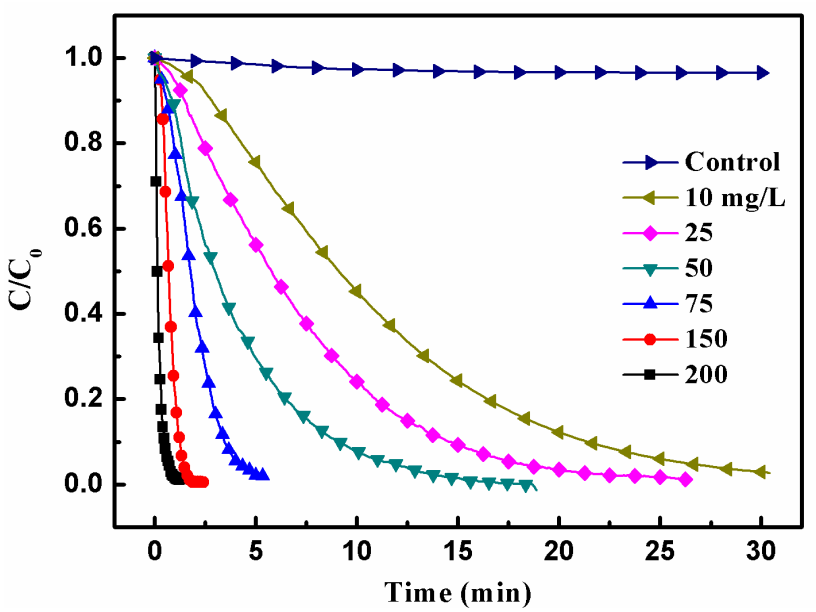


Fig. S10 Catalytic activity of M30 at different concentration ([AP]= 1 × 10^{-4} M, [$NaBH_4$]= 0.1 M)

In the reported work (Langmuir 2010, 26, 2885), at the concentration of 1200 mg /L for catalysts ([AP]= 1 × 10^{-4} M, [$NaBH_4$]= 0.1 M), It takes about 8 min to finish this catalysis reaction. Compared with it, our catalysts have a higher catalysis activity.

References

1. P. Zhang, C. Shao, Z. Zhang, M. Zhang, J. Mu, Z. Guo and Y. Liu, *Nanoscale*, 2011, **3**, 3357-3363.

2. J. Wu, N. Zhao, X. Zhang and J. Xu, *Cellulose*, 2012, **19**, 1239-1249.

3. S. Saha, A. Pal, S. Kundu, S. Basu, T. Pal, Langmiur, 2010, **26**, 2885-2893