Supplementary materials

RSC Advances

In situ synthesis and immobilization of Cu(II)-pyridyl complex on silica microsphere as a new Fenton-like catalyst for RhB degradation at near-neutral pH

Wenhua Yuan[1], Chaoying Zhang[1], Hong Wei[2], Qinqin Wang[1], Kebin Li[1*]

[1]College of Chemistry & Material Science, Key Laboratory of Synthetic and Natural Function Molecule Chemistry, Ministry of Education, Northwest University, Xi'an 710069, PR China;

[2] State Key Laboratory Base of Eco-Hydraulic Engineering in Arid Areas, Xi'an University of Technology, Xi'an 710048, PR China

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[*]Corresponding author. Phone: +001-132-5988-2543, E-mail: kebin68li@163.com
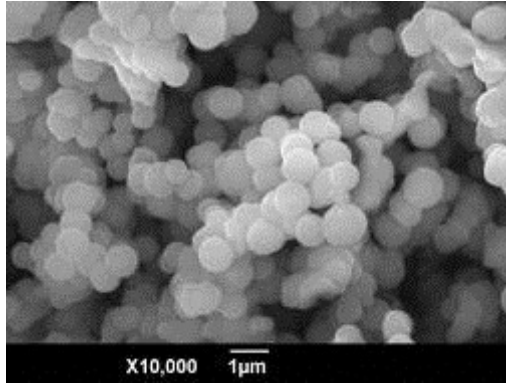
E-mail: kebin68li@163.com
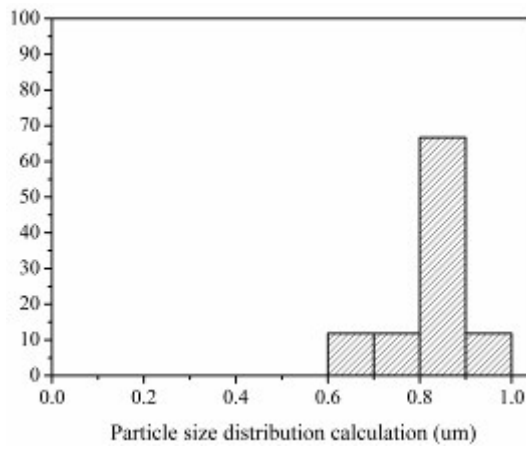
Fig. S1 SEM image of the prepared silica particles

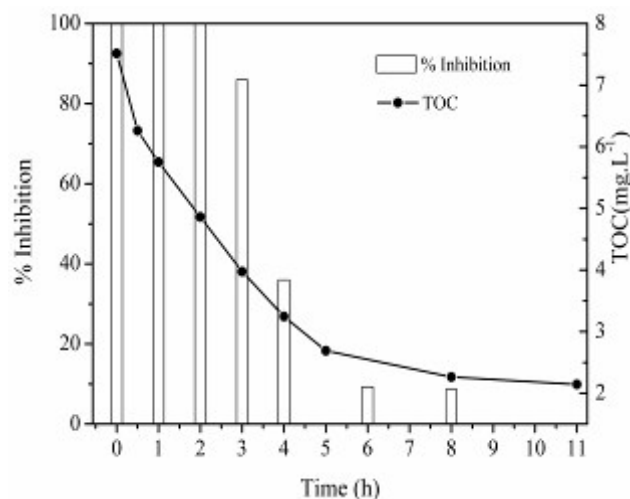Fig. S2 Size distribution of the silica microspheres

Fig. S3 Temporal changes of TOC and toxicity during the degradation of 10 mg·L^{-1} RhB. ([catalyst]=2 g·L^{-1}; [H$_2$O$_2$]=200 mg·L^{-1}; pH =7.1; T=20 ℃).
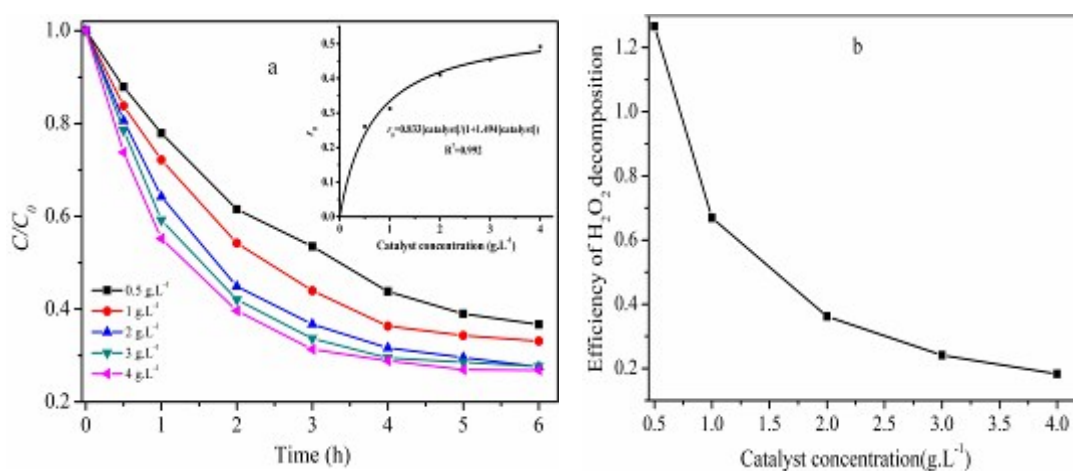

Fig. S4. Decomposition of H$_2$O$_2$ catalyzed by the prepared catalyst. (a) Effects of catalyst dosage on H$_2$O$_2$ decomposition. (b) Efficiency of H$_2$O$_2$ decomposition versus catalyst dosage. Decomposition efficiency (DE) was assessed by the following equation:

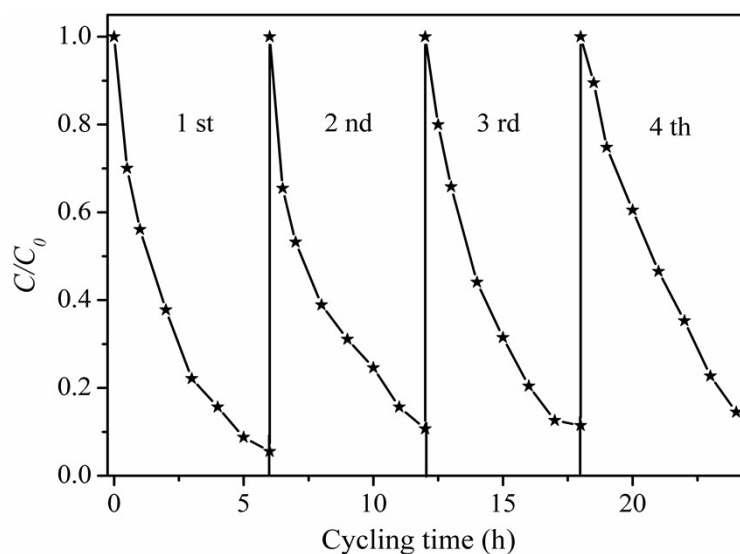$$DE = \frac{\Delta[H_2O_2]}{[H_2O_2][catalyst]} \times 100\%$$

Fig. S5 Time profiles for the cyclic degradation of RhB. ([RhB]=5 mg·L^{-1}; [catalyst]=2 g·L^{-1}; [H$_2$O$_2$]=200 mg·L^{-1}; pH =7.1; T=20 ℃)

Table S1 The kinetic parameters for RhB degradation under various experimental conditions

Concentration of catalyst (g·L^{-1})	k(h^{-1})	R^2	
0.5	0.360	0.998	
1	0.395	0.995	
2	0.484	0.998	
3	0.547	0.997	
4	0.556	0.992	
Concentration of H$_2$O$_2$ (mg·L^{-1})			
50	0.251	0.996	
100	0.369	0.997	
150	0.453	0.998	
200	0.484	0.998	
250	0.607	0.997	
300	0.665	0.996	
Concentration of dye (mg·L^{-1})	k(h^{-1})	R^2	r_0(mg·L^{-1}·h^{-1})
2.5	0.574	0.992	0.252
5	0.484	0.998	0.314
10	0.392	0.997	0.454
12.5	0.306	0.995	0.476

Table S2 Rate constants and the activation parameters for the degradation of RhB with H_2O_2 catalyzed by Cu(II)–pyridyl complex immobilized on silica microspheres

T(K)	Rate constant		Activation parameters			
	k (h^{-1})	R^2	E_a (kJ·mol^{-1})	$\triangle S^{\#}$ (J·mol^{-1}·K^{-1})	$\triangle H^{\#}$ (kJ·mol^{-1})	$\triangle G^{\#}$ (kJ·mol^{-1})
293.15	0.483	0.996				
297.65	0.587	0.984	38.60	-119.55	36.13	71.71
307.65	0.972	0.993				
317.65	1.597	0.991				