Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A

Supporting Information

Highly efficient catalytic reduction of bromate in water over a quasi-monodisperse, superparamagnetic Pd/Fe_3O_4 catalyst

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Results and discussion

Reaction limitation examination in catalytic bromate reduction by Pd(x)/Fe_3O_4 catalyst. The effect of the hydrogen flow rate on the bromate conversion with the treatment time could be found in Figure S4a. It demonstrated that the hydrogen flow rate increase from 50 mL/min to 200 mL/min did not result in much change in the bromate reduction. The effect of the stirring speed on the bromate conversion with the treatment time could be found in Figure S4b, where the stirring speed increase from 200 rpm to 800 rpm did not change the bromate reduction much either. The little effect on bromate reduction from the hydrogen flow rate and the stirring speed indicated that the liquid/gas/solid mass transport limitation was not significant under the current experimental setup. The effect of the catalyst mass on the initial bromate conversion rate could be found in Figure S4c. It demonstrated that the initial bromate conversion rate was directly proportional to the catalyst weight ($R^2 \sim 0.999$). This observation suggested that the chemical limitation played the major role for catalytic bromate reduction under the current experimental setup, and the internal masstransport could be ignored.

Table S1 Characteristics of the bottled mineral water sample

Component	Concentration (mg/L)
Ca^{2+}	38.89
Na^{+}	7.69
HCO_3^{-}	170.65
Cl^{-}	0.69
Mg^{2+}	10.81
Sr^{2+}	0.17
K^{+}	0.35
H_2SiO_3	26.65
SO_4^{2-}	24.64
pH	7.77

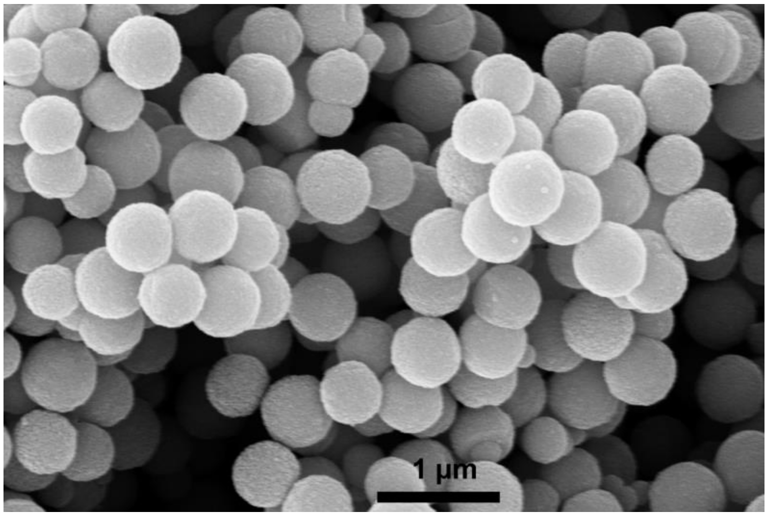

Figure S1. The SEM image of Fe_3O_4 microspheres.

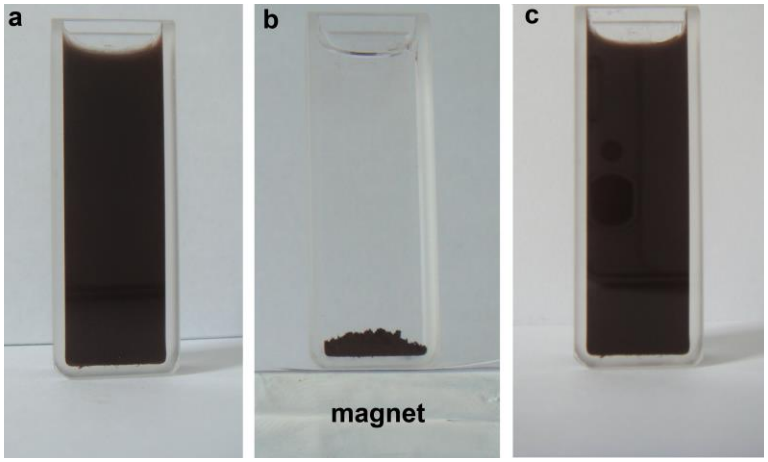

Figure S2. The digital photographs of Pd(0.1)/MFe_3O_4 responding to external magnetic field: (a) without external magnetic field, (b) with external magnetic field, and (c) after the removal of external magnetic field.

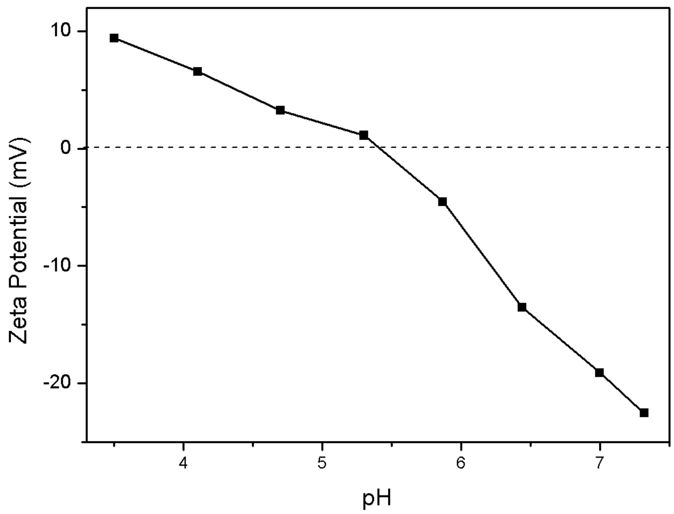

Figure S3. Zeta-potential measurement result of Pd(0.1)/Fe_3O_4 catalyst at different pHs.

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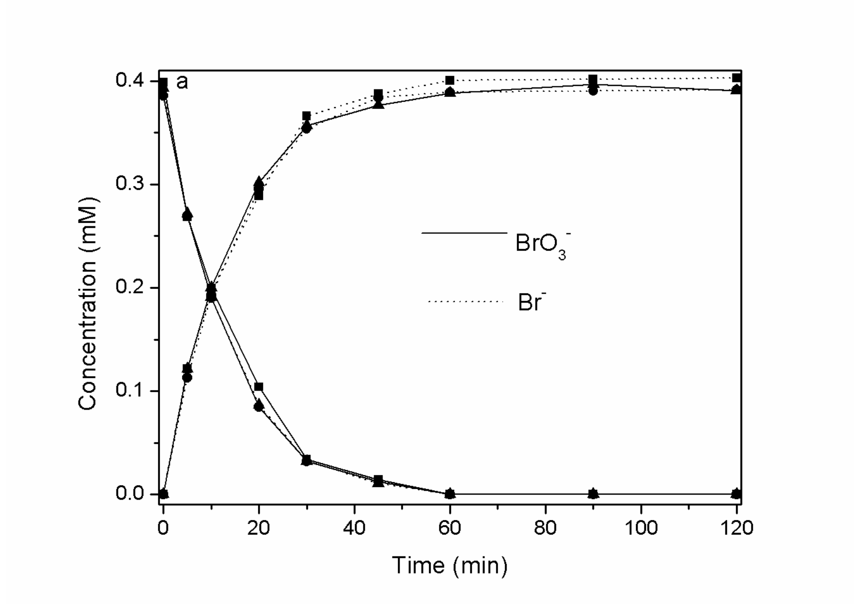
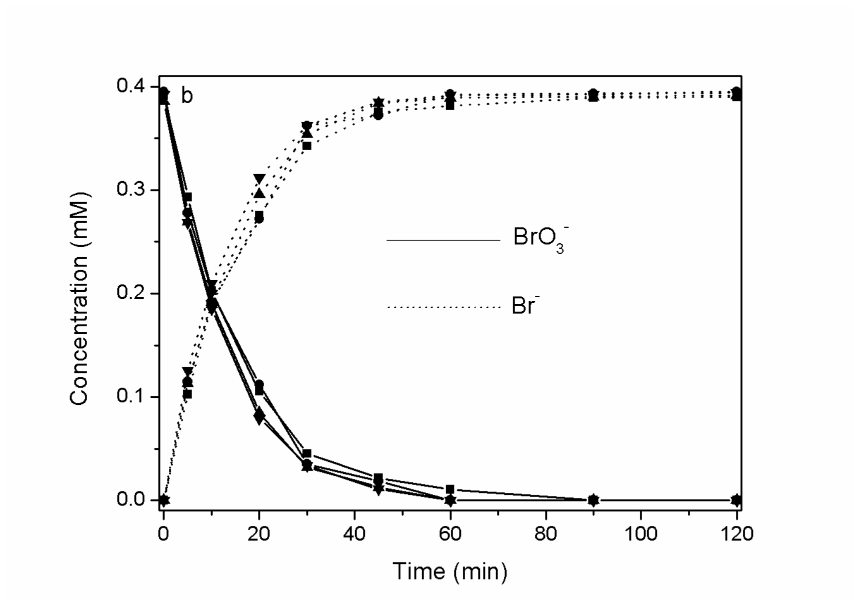
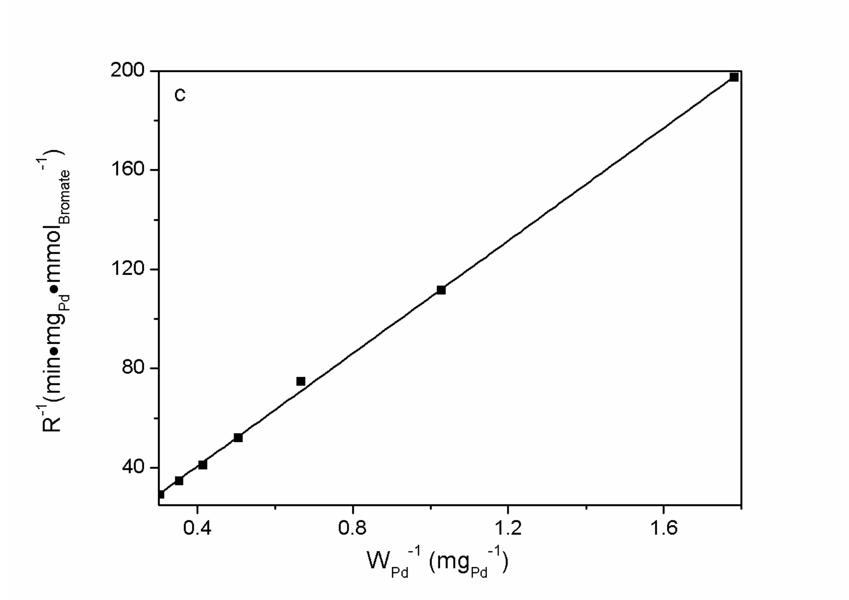


(a)



(b)



(c)

Figure S4. (a) The influence of H_2 flow rate on bromate reduction (■ 50 mL/min, ▲ 100 mL/min, ● 200 mL/min). (b) The influence of stirring speed on the bromate reduction (■ 200r/min, ▲ 400 r/min, ▼ 600 r/min, ● 800 r/min). (c) The influence of Pd(0.1)/Fe_3O_4 catalyst weight on the bromate reduction.

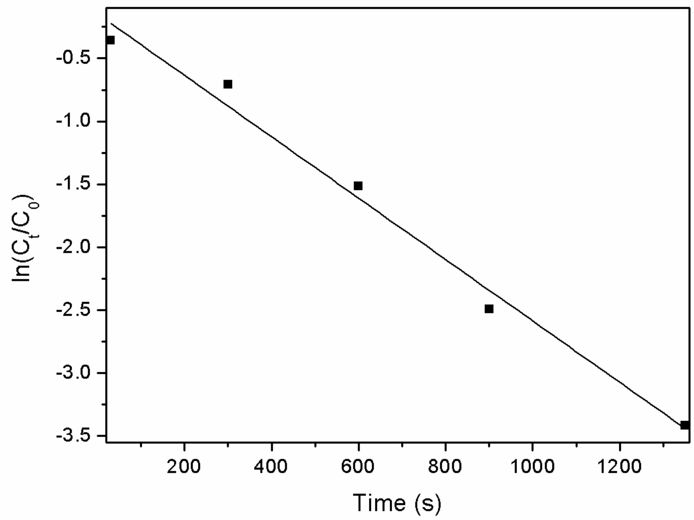


Figure S5. The catalytic bromate reduction data fitting curve by pseudo-first-order kinetic model.