Electronic Supplementary Material (ESI) for RSC Advances

Electronic Supplementary Information

Rapid detemplation of nanozeolite β: microwave-assisted Fenton-like oxidation

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The detailed calculation of H_2O_2/TEA^+ and Fe^{3+}/H_2O_2 are showed as follow:

For the as-prepared nanozeolite β:

$$\frac{H_2O_2(mol)}{TEA^+(mol)} = \frac{\frac{V_{H_2O_2}ml \times 1.1g/ml \times 30\%}{34g/mol}}{\frac{150mg \times 0.8 \times 10^{-3}}{147g/mol}} = 11.89V_{H_2O_2} \qquad (1)$$

Herein, the amount of TEA^+ in the solution is determined by the volume of as-prepared β nanozeolite solution and the mass of TEAOH in the synthesis receipts, which means that TEAOH(g)/Nanozeolite$_{as\text{-}prepared}$(g) is 0.8 and the mass of β nanozeolite added in the system is 150 mg. $V_{H_2O_2}$ presents the addition volume of H_2O_2 in the as-prepared β nanozeolite system.

For the washed β nanozeolite:

$$\frac{H_2O_2(mol)}{TEA^+(mol)} = \frac{\frac{V'_{H_2O_2}ml \times 1.1g/ml \times 30\%}{34g/mol}}{\frac{150mg \times 0.2 \times 10^{-3}}{130g/mol}} = 42.06V'_{H_2O_2}$$

The mass of TEA^+ in the washed nanozeolite solution was determined by the TG analysis (Fig. 2b-I). It was indicated (Fig. 2b-I) that TEA^+ in the micropores of the as-prepared β could reach about 20 wt%, i.e., TEA^+(g)/Nanozeolite$_{washed}$(g) = 0.2, and the mass of β nanozeolite added in the system is 150 mg. $V'_{H_2O_2}$ presents the addition volume of H_2O_2 in the washed β nanozeolite system.

$$\frac{Fe^{3+}(\mu mol)}{H_2O_2(mol)} = \frac{V_{Fe^{3+}}\mu L \times 0.2 mol/L}{\frac{V_{H_2O_2}(V'_{H_2O_2})ml \times 1.1 g/ml \times 30\%}{34 g/mol}} = 20.606 \frac{V_{Fe^{3+}}}{V_{H_2O_2}(V'_{H_2O_2})}$$

$V_{Fe^{3+}}$ presents the addition volume of Fe $(NO_3)_3$ of 0.2 M in the as-prepared (or washed) β nanozeolite system.

Table S1 Fe/Si ratios in Fenton-treated β with different compositions before and after acid wash step.

Sample [a]	8	5	9	10
Fe^{3+}/ H_2O_2 (10^{-6} mol/mol)	15.45	9.27	4.64	2.32
Fe/Si before acid wash[b]	2.6×10^{-3}	2.1×10^{-3}	1.9×10^{-3}	1.5×10^{-3}
Fe/Si after acid wash[b]	n.d.[c]	n.d.	n.d.	n.d.

a: the No. of sample and reaction condition are corresponding to those in Table 1. b: The Fe/Si ratios of nanozeolites were detected by EDX (Philips XL 30). c: n.d. = not detected.

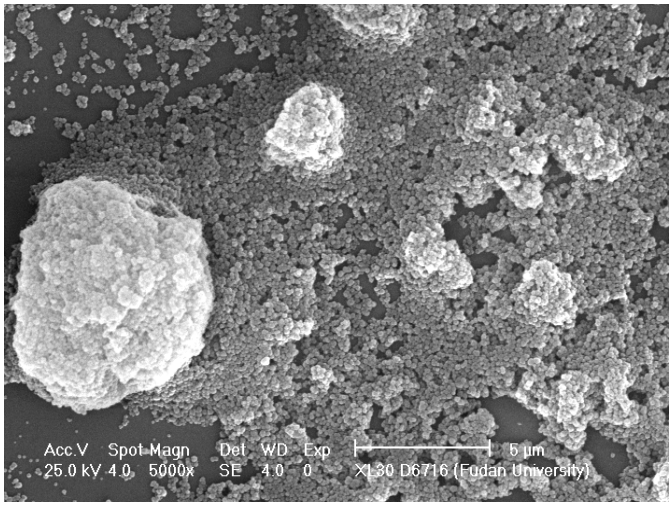

Fig. S1 SEM image of calcined β nanozeolite.

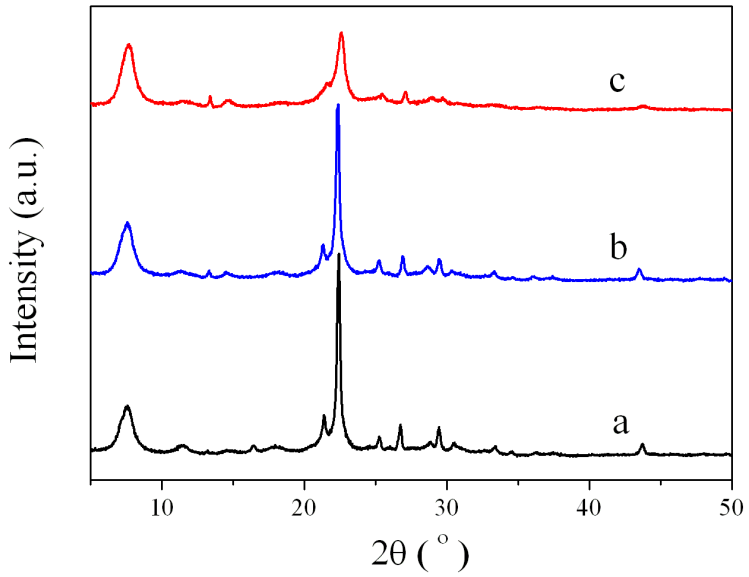

Fig. S2 XRD patterns of as-prepared β (a), Fenton-treated β (b) and calcined β (c).

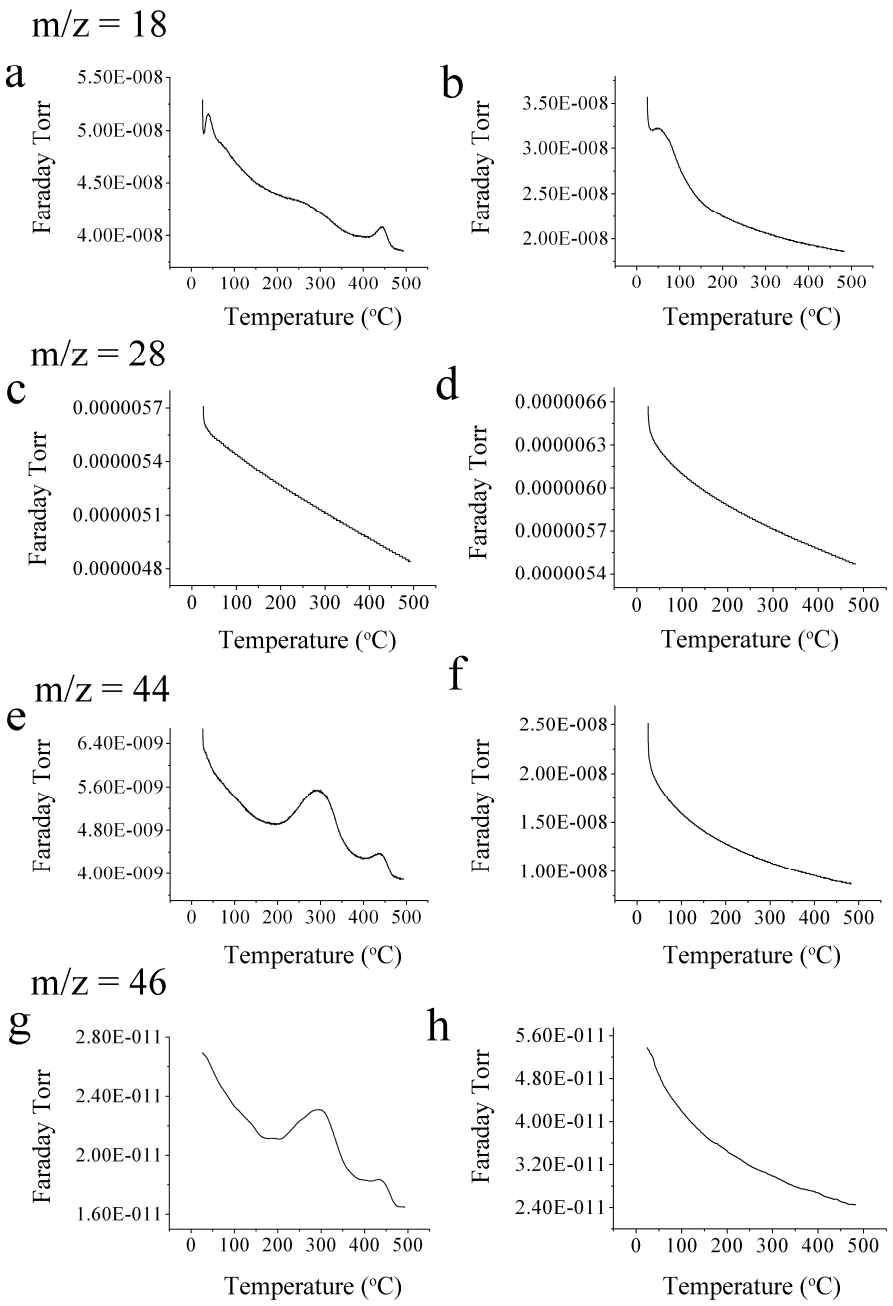

Fig. S3 MS signals of H_2O (m/z =18), CO (m/z = 28), CO_2 (m/z = 44) and NO_2 (m/z = 46) evolved when the as-prepared β (a, c, e, g) and Fenton-treated β (b, d, f, h) heated from 25 to 480 ^{o}C in air.

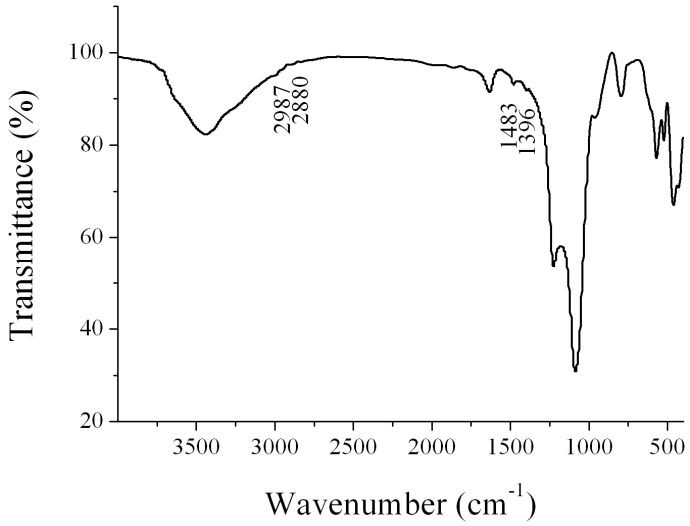

Fig. S4 FTIR spectrum of the Fenton-treated sample by an electric oven at 170 ^{o}C for 120 min. The C-H stretching (2987 and 2880 cm^{-1}) and bending (1483 and 1396 cm^{-1}) vibrations corresponding to SDAs are still observed.