

Electronic Supplementary Information

Mesoporous graphitic carbon nitride functionalized iron oxides for promoting phenol oxidation activity

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1. Fenton performance of sample Fe_2O_3 , Fe_3O_4 , Fe/SBA-15 , and Fe/ZSM-5 .

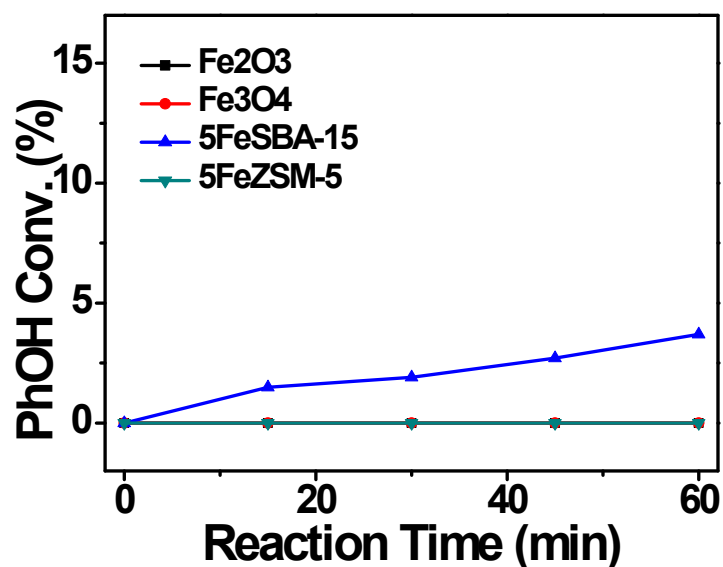


Fig. S1. Phenol conversion in the presence of (a) Fe_2O_3 , (b) Fe_3O_4 , (c) 5% Fe/SBA-15 , (d) 5% Fe/ZSM-5 . Reaction conditions: Molar ratio: 14 H_2O_2 : 1 phenol, 20 mg catalyst: 50 ml phenol (1 g/L), temperature is 35 °C.

The catalytic activity of Fe_2O_3 , Fe_3O_4 , 5% Fe/SBA-15 , and 5% Fe/ZSM-5 were evaluated for the phenol oxidation reaction for comparison with the carbon nitride supported catalysts discussed in the main manuscript. The former two samples are obtained from Aladdin Industrial Corporation, and the latter two samples are prepared through incipient wetness impregnation with $\text{Fe}(\text{NO}_3)_3$ as the iron source and SBA-15 or ZSM-5 as the support. As can be seen from Fig. S1, samples Fe_2O_3 , Fe_3O_4 , and 5% Fe/ZSM-5 show no phenol conversion which indicates a poor catalytic activity. Though the SBA-15 supported catalyst shows a small amount of phenol conversion at ca. 3%, it is still very poor catalytic performance when compared with the samples $\text{FeO}_x/\text{g-C}_3\text{N}_4$.

2. The reusability of the as-prepared sample FeM30.

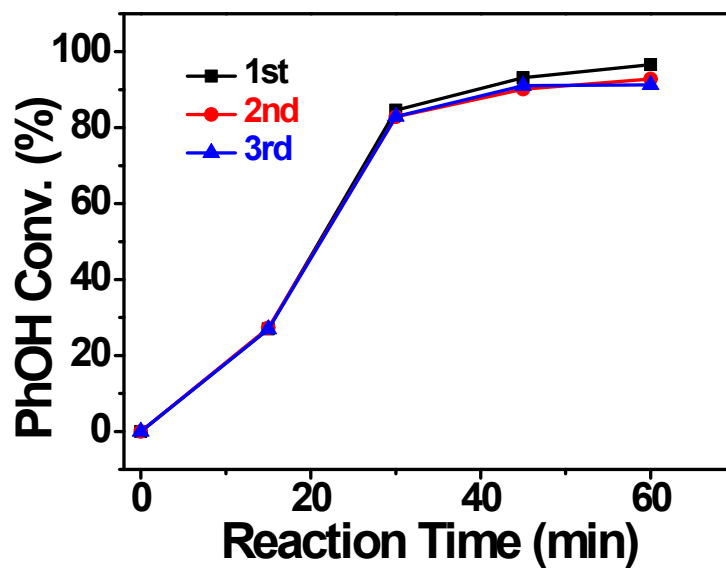


Fig. S2. Reusability of sample FeM30 for catalytic oxidation of phenol. Reaction conditions: Molar ratio: 14 H₂O₂: 1 phenol, 20 mg catalyst: 50 ml phenol (1 g/L), temperature is 35 °C.

3. XPS spectra of g-C₃N₄ prepared from melamine.

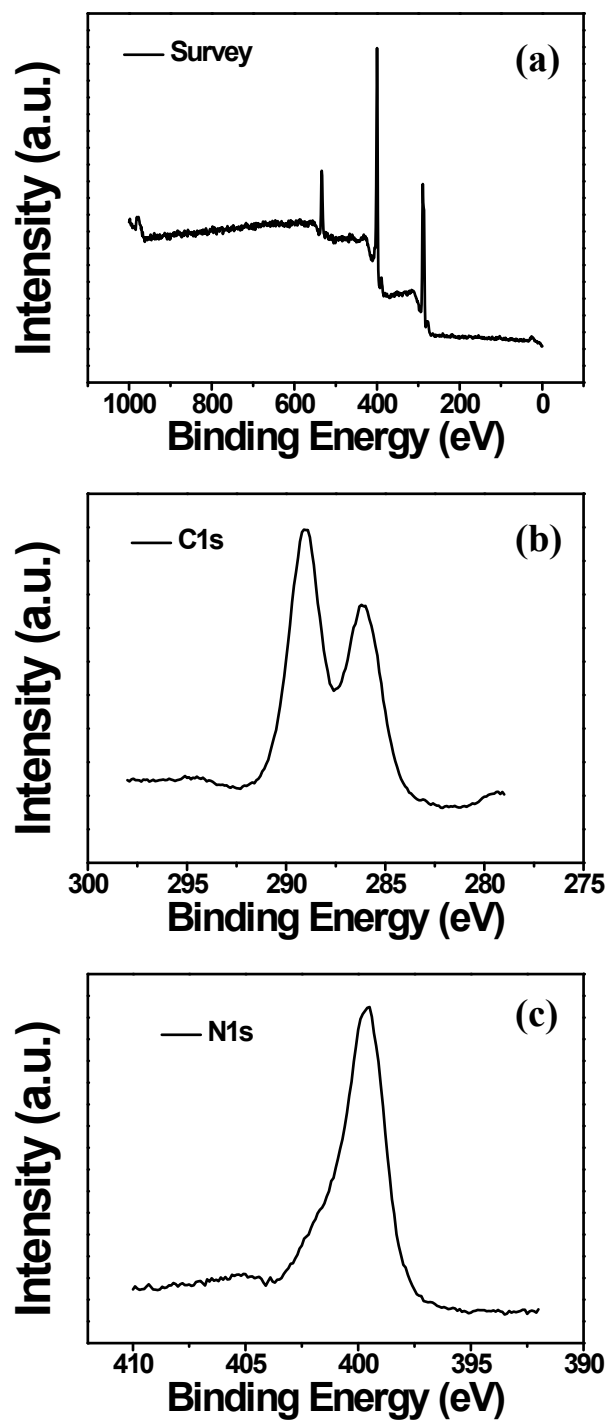


Fig. S3. XPS spectra of sample g-C₃N₄.

4. DTG curves of sample g-C₃N₄ and FeM0.

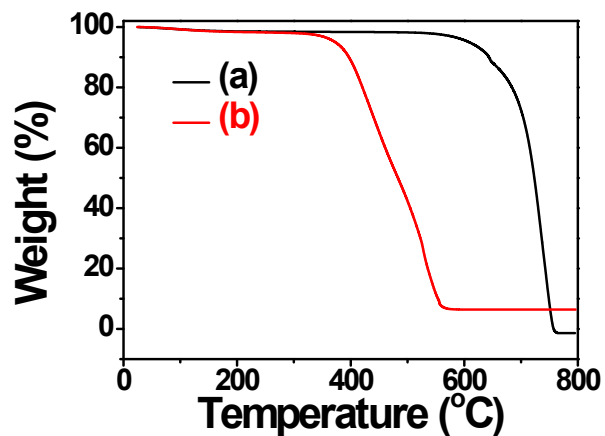


Fig. S4. DTG curves of sample (a) g-C₃N₄ and (b) FeM0.

As shown in Fig. S4, the pyrolysis of g-C₃N₄ begin from ca. 600 °C which is consistent with the reported literature. On the contrary, the pyrolysis temperature of sample FeM0 largely moved to a lower temperature from 350 °C to 550 °C, which indicates the strong interaction between iron species and the g-C₃N₄ support.

5. Influence of calcination temperature on Fenton performance.

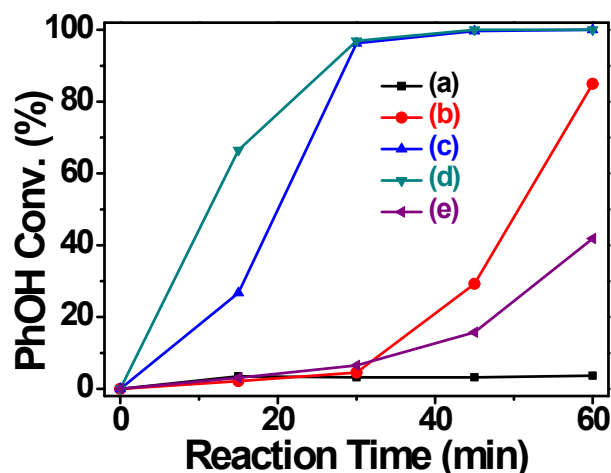


Fig. S5. Phenol conversion in the presence of (a) FeM0-300, (b) FeM0-350, (c) FeM0-400, (d) FeM0-450, (e) FeM0-500. Reaction conditions: Molar ratio: 14 H₂O₂: 1 phenol, 20 mg catalyst: 50 ml phenol (1 g/L), temperature is 40 °C.

To consider the effect of calcination temperature on catalyst performance, the precursor of sample FeM0 was calcined at different temperatures. The samples were coded as FeM0-T, where T represents the calcination temperature. Sample FeM0-450 and FeM0 in the main manuscript are the same sample. As can be seen from Fig. S5, almost no phenol is converted in 60 minutes over FeM0-300. Increasing the calcination temperature for FeM0-450, the initial phenol conversion of phenol gradually increases from 0% to 100% in 60 minutes which indicates the highest catalytic activity. For sample FeM0-450, phenol conversion can reach almost 100% in 30 minutes. Further increasing the calcination temperature to 500 degree Celsius, the initial phenol conversion shows a decline. Therefore, we choose 450 degree Celsius as the calcination temperature for preparation of FeO_x/g-C₃N₄.

6. Influence of calcination temperature on Fenton performance.

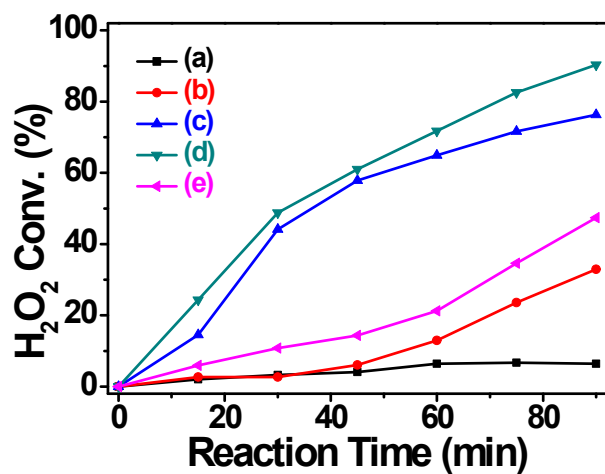


Fig. S6. H₂O₂ conversion in the presence of (a) FeM0-300, (b) FeM0-350, (c) FeM0-400, (d) FeM0-450, (e) FeM0-500. Reaction conditions: Molar ratio: 14 H₂O₂: 1 phenol, 20 mg catalyst: 50 ml phenol (1 g/L), temperature is 40 °C.

7. The products and byproducts for phenol oxidation reaction.

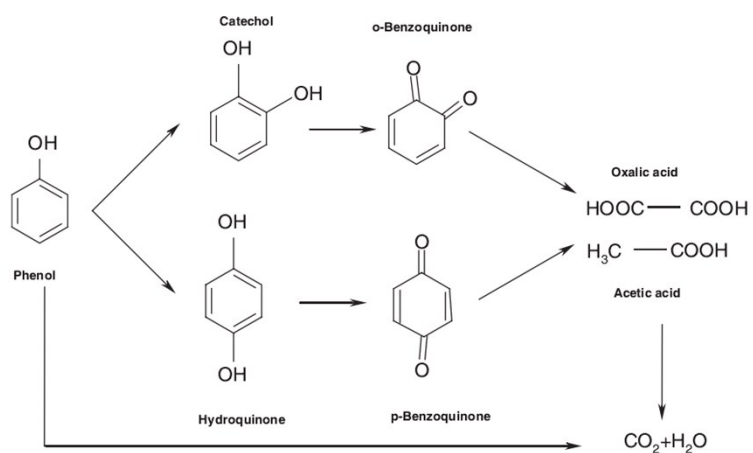


Fig. S7. The products and byproducts for phenol oxidation reaction.

8. FT-IR spectra of (a) M0, (b) M5, (c) M15, (d) M30, (e) M50, (f) M80.

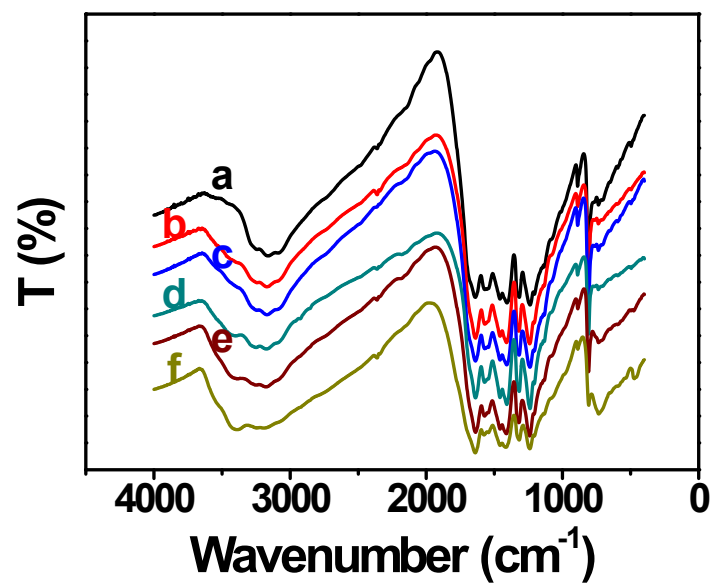


Fig. S8. FT-IR spectra of (a) M0, (b) M5, (c) M15, (d) M30, (e) M50, (f) M80.