Supporting Materials for

Synergistic degradation of PNP via coupling H_2O_2 with persulfate catalyzed by nano zero valent iron

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Fig. S1

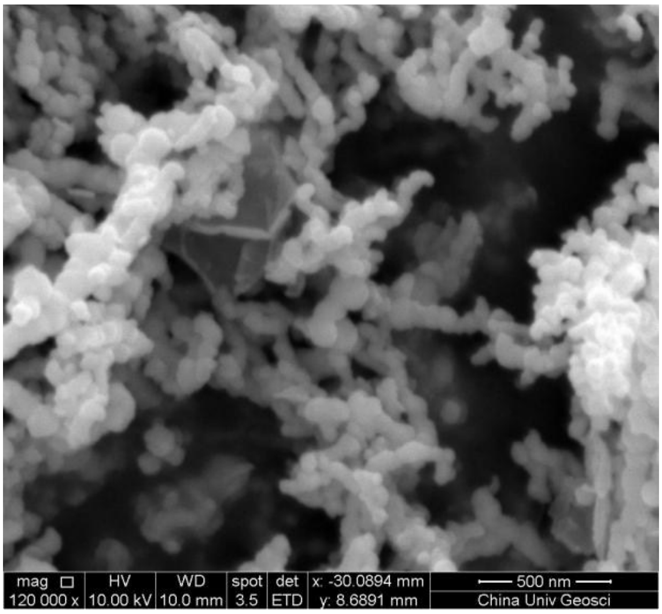


Fig.S1 The SEM image of nZVI.

Fig. S2

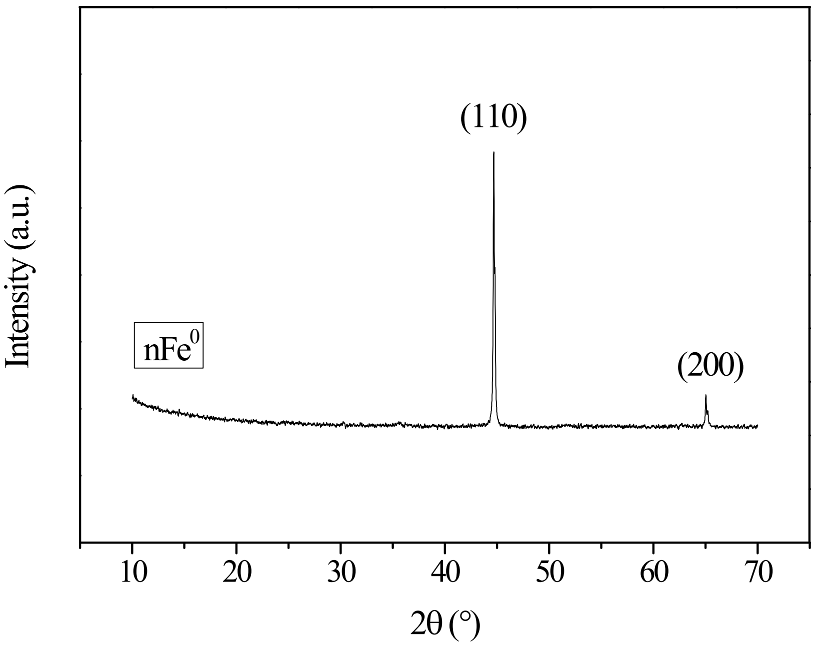


Fig.S2 The XRD pattern of nZVI.

Fig. S3

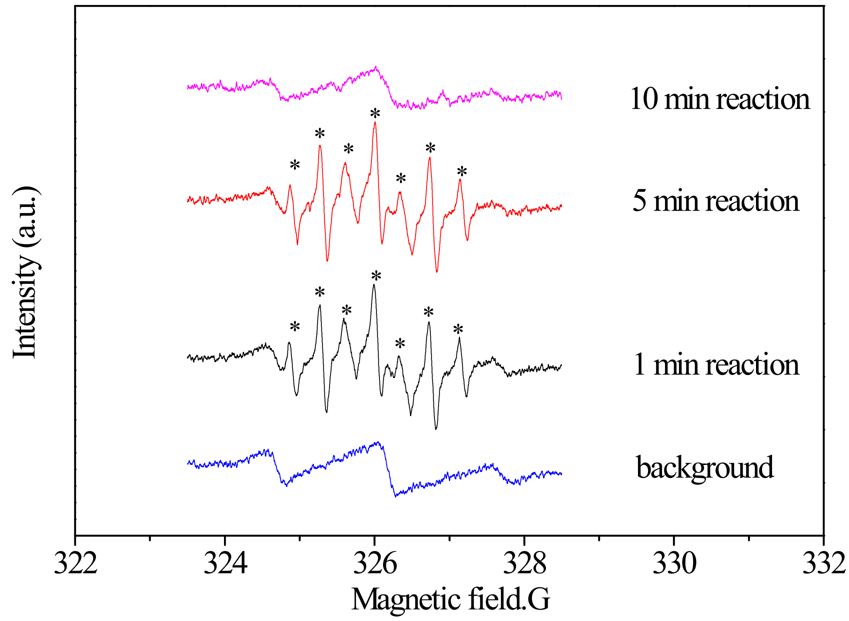


Fig.S3 EPR spectra obtained for nZVI/PDS/H_2O_2 dual oxidation systems. Reaction condition: $[nZVI]_0$=0.2 g/L, $[PNP]_0$=20 mg/L, $[H_2O_2/PDS\ (1:1)]_0$ = 2 mmol/L.

Fig. S4

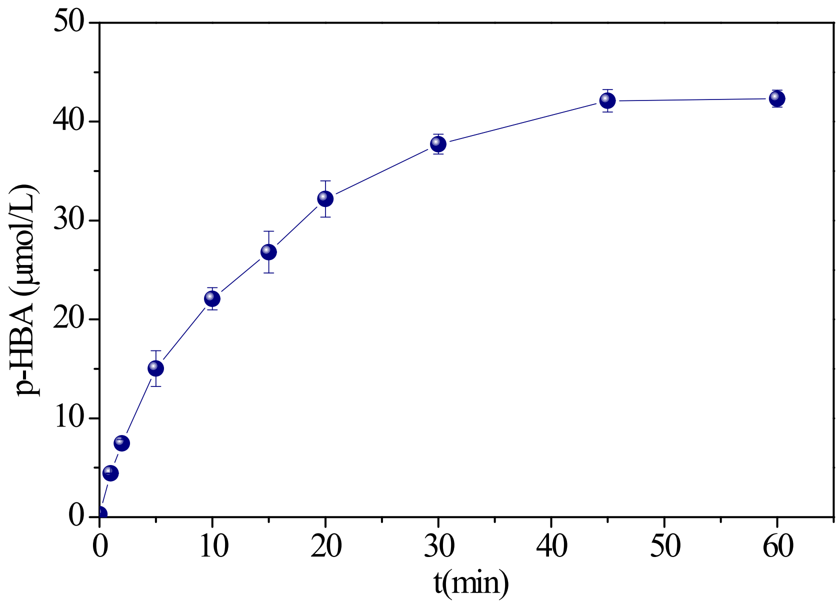
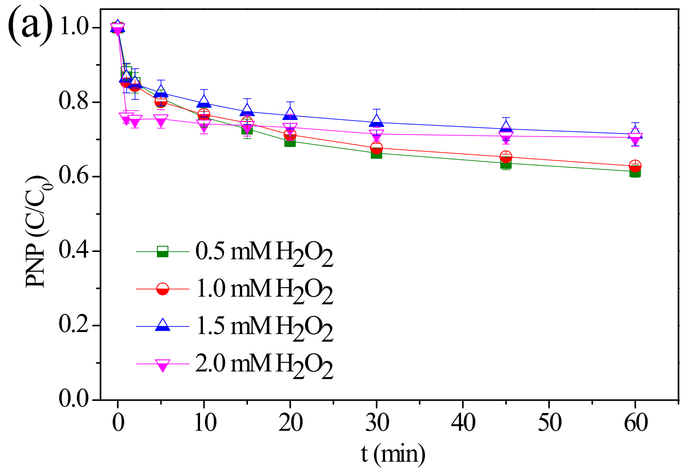


Fig.S4 Time-profile production of p-HBA from the oxidation of BA in the nZVI/PDS/H_2O_2 system. Reaction condition: $[nZVI]_0$=0.2 g/L, $[PNP]_0$=20 mg/L, $[H_2O_2/PDS\ (1:1)]_0$ = 2 mmol/L, [BA]=5 mmol/L, initial pH=7.

Fig. S5



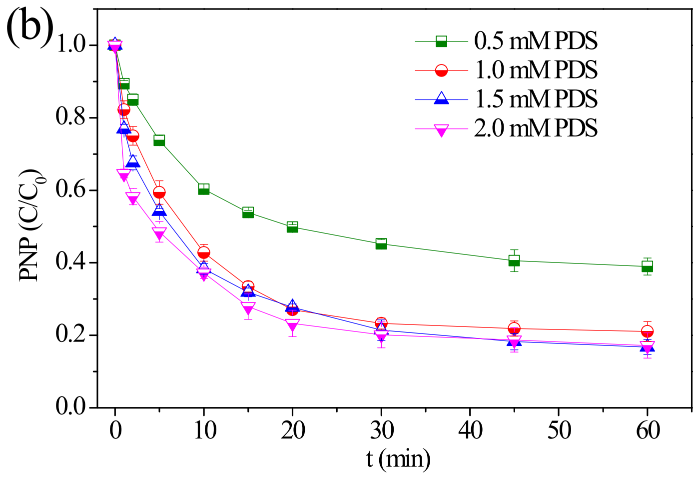
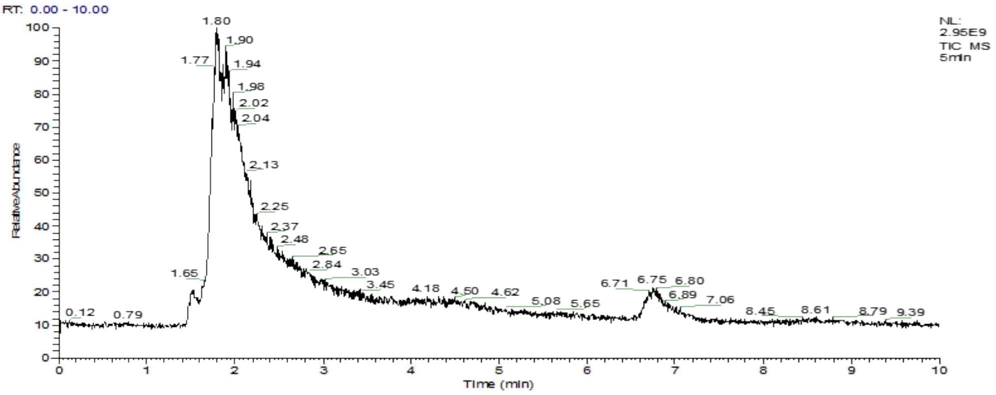
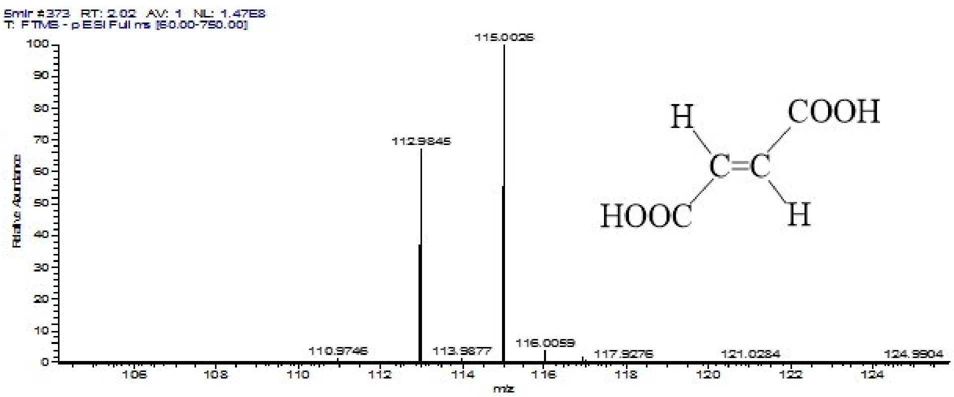


Fig.S5 PNP degradation in nZVI/H_2O_2 and nZVI/PDS oxidation systems with different oxidant dosage. Reaction condition: $[nZVI]_0 = 0.2$ g/L, $[PNP]_0 = 20$ mg/L, initial pH=7.

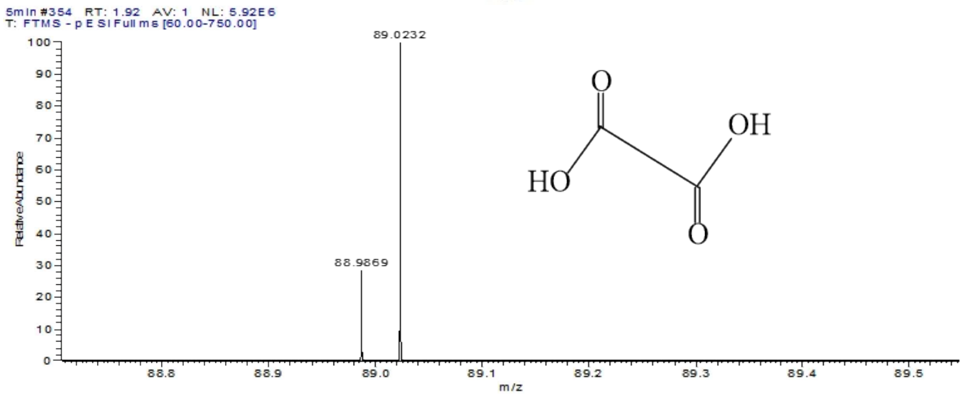
Fig. S6



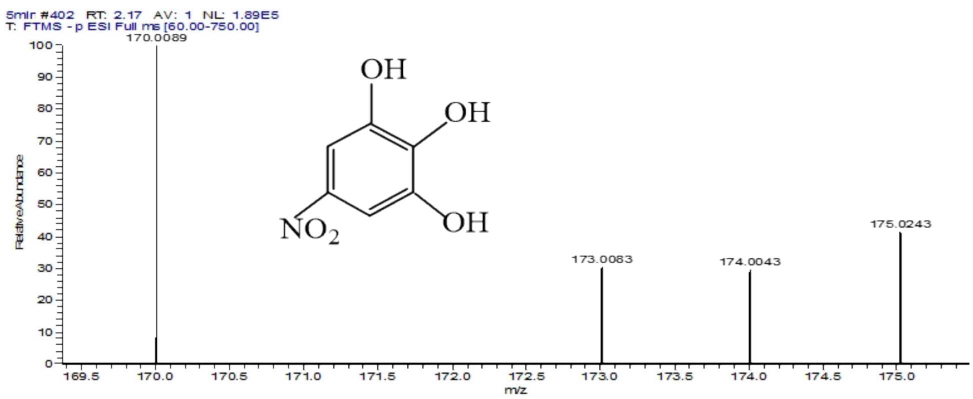
RT: 0.00 - 10.00
NL: 2.95E9
TIC MS
5min
1.80
1.90
1.77
1.94
1.98
2.02
2.04
2.13
2.25
2.37
2.48
2.65
2.84
3.03
3.45
4.18
4.50
4.62
5.08
5.65
1.65
0.12
0.79
6.71
6.75
6.80
6.89
7.06
8.45
8.61
8.79
9.39
Relative Abundance
Time (min)



5min #373 RT: 2.02 AV: 1 NL: 1.47E8
T: FTMS - p ESI Full ms [60.00-750.00]
115.0026
112.9845
110.9746
113.9877
116.0059
117.9276
121.0284
124.9904
Relative Abundance
m/z
H
COOH
C=C
HOOC
H



5min #354 RT: 1.92 AV: 1 NL: 5.92E6
T: FTMS - p ESI Full ms [60.00-750.00]
89.0232
88.9869
Relative Abundance
m/z
O
OH
HO
O



5min #402 RT: 2.17 AV: 1 NL: 1.89E5
T: FTMS - p ESI Full ms [60.00-750.00]
170.0089
173.0083
174.0043
175.0243
Relative Abundance
m/z
OH
OH
OH
NO2

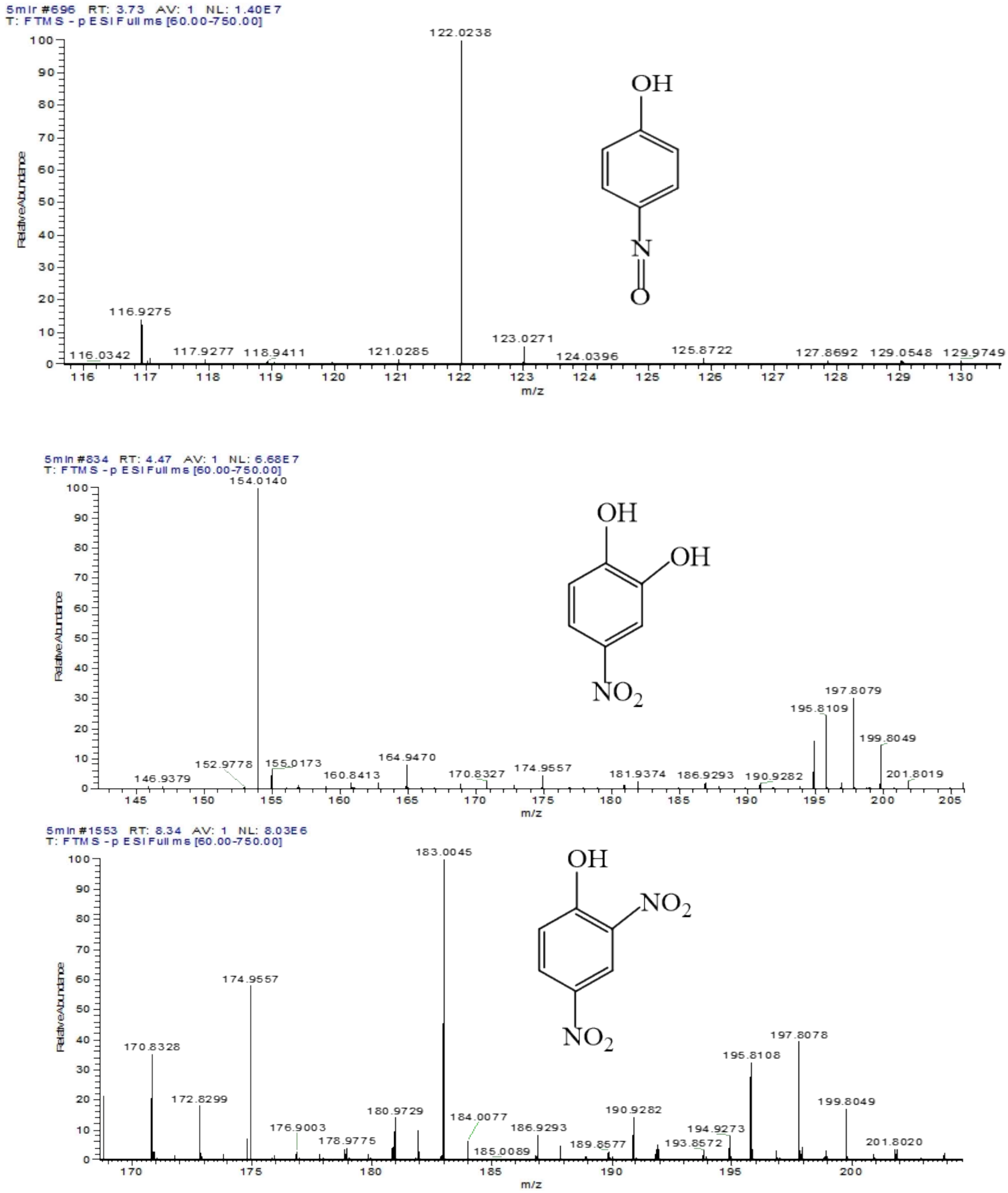


Fig.S6 The LC-HRMS spectra and mass spectrum of PNP intermediates in the nZVI/H_2O_2/PDS dual oxidation system.

Table. S1

Table S1. Detected degradation intermediates of p-nitrophenol

No.	Retention time (min)	m/z	intermediates
1	2.02	115.0026	fumaric acid
2	2.14	88.9869	oxalic acid
3	2.14	170.0084	5-nitryl-1,2,3-hydroxyquinol
4	3.70	122.0236	p-nitrosophenol
5	4.50	154.0135	4-nitrocatachol
6	8.33	183.0036	2,4-dinitrophenol