

Supporting information

Enhanced dechlorination performance of 2,4-dichlorophenol by vermiculite supported iron nanoparticles doped with palladium

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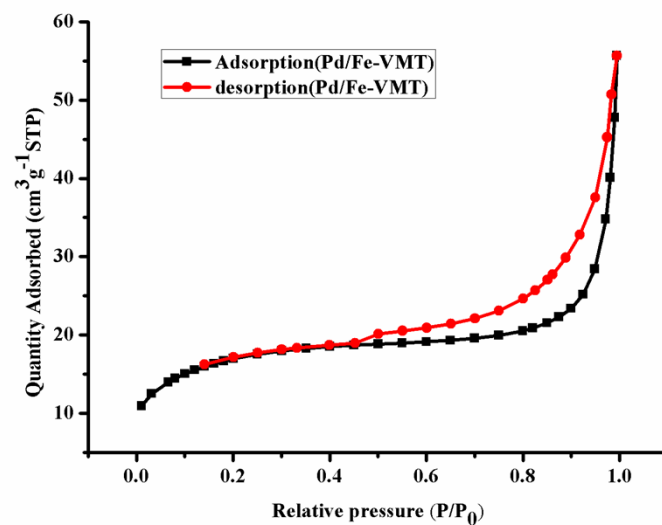


Fig. S1. Nitrogen adsorption-desorption isotherms of Pd/Fe-VMT.

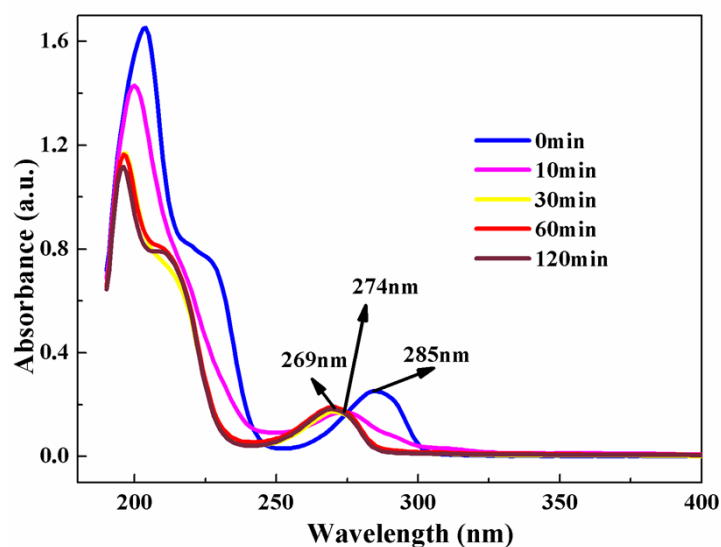


Fig. S2. UV spectra of 2,4-DCP solution during the reaction (experimental conditions: T=30

°C, pH=5.0, $C_{\text{Pd/Fe-VMT}}=1.0 \text{ g L}^{-1}$, Pd loading = 1.0 wt.%).

The UV scan of 2,4-DCP at different intervals (0, 10, 30, 60 and 120 min) is shown in Fig. S2.

There were three peaks of 285 nm, 274 nm and 269 nm corresponding to the absorption peaks of 2,4-DCP, *o*-CP and phenol, respectively. As can be seen from the Fig. S2, there was a

significant reduction at the peak of 285 nm, the peak of 247 nm was also weakened after 30 minutes. It could be seen a significantly peak at 269 nm. All of these changes illustrated that 2,4-DCP generated *o*-CP, *p*-CP and phenol during reaction which is apparent that almost all 2,4-DCP were first transformed into *o*-CP rather than *p*-CP and then reduced to phenol during the whole dechlorination process ¹. According to the literatures ^{2, 3}, the nZVI plays a role of a strong reductant during the dechlorination reaction process, while the Pd plays two important roles which disintegrates the H₂ chemisorptions during the iron corrosion and provides a high efficient hydrogen radical through the decomposition of H₂. However, it could not be found the peak of *p*-CP in the Fig. S1. This result suggested an important fact that the small amount of *p*-CP confirmed that it was favorable to dechlorinate the ortho-position of 2,4-DCP, which gave an excellent yield of *o*-CP.

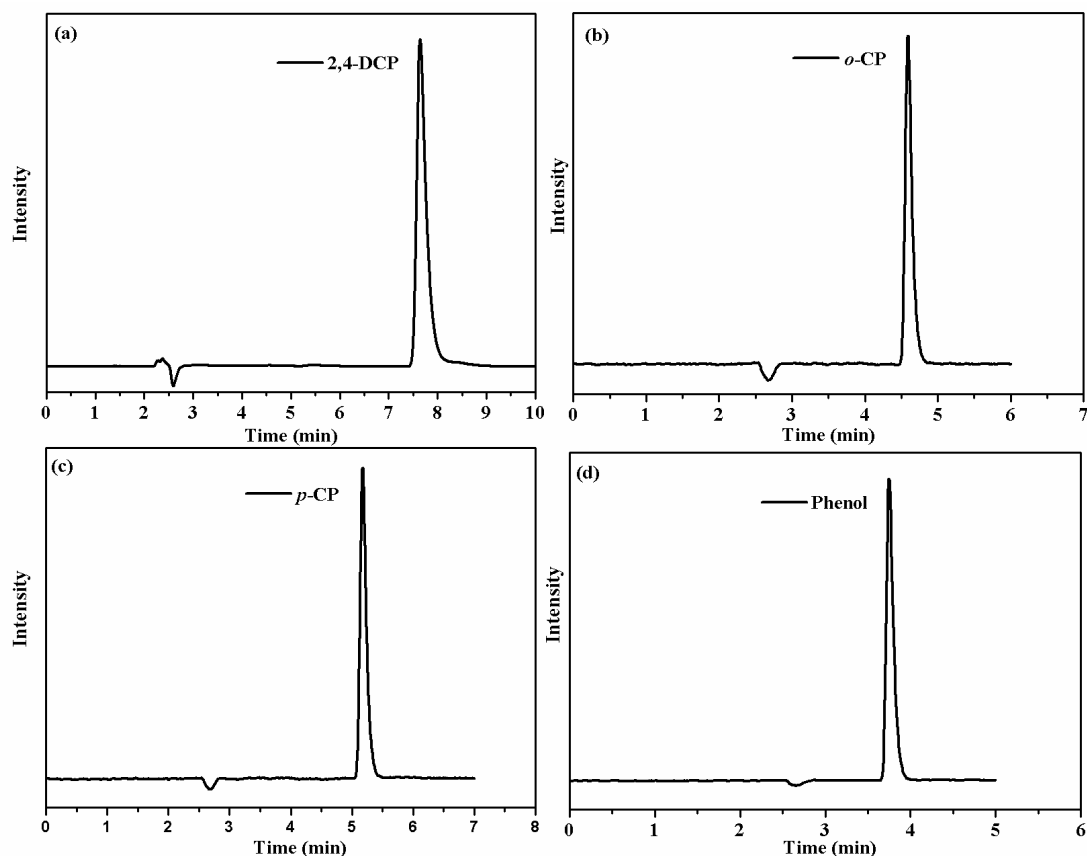


Fig. S3. The retention time of the standard substance of 2,4-DCP, *o*-CP, *p*-CP and Phenol. (experimental conditions: $T=30\text{ }^{\circ}\text{C}$, $\text{pH}=5.0$, $C_{\text{Pd/Fe-VMT}}=1.0\text{ g L}^{-1}$, the palladium content was 1.0 wt.%)

In the experiment, the standard substance of 2,4-DCP, *o*-CP, *p*-CP and Phenol were used to determin the retention time of them by high performance liquid chromatograph, respectively..

Table S1 the percentage of dechlorination products under the optimal reaction conditions.

Reaction time (min)	The percentage of different products (%)				
	2,4-DCP	<i>o</i> -CP	<i>p</i> -CP	Phenol	Total
0	100	0	0	0	100
3	65.00	8.35	6.20	12.69	92.24
5	43.74	12.41	8.23	37.84	97.22
10	16.06	11.11	8.66	54.62	90.45
20	4.13	10.92	8.78	63.08	86.92

30	2.68	6.77	7.29	78.20	94.94
40	1.92	3.87	5.45	86.97	98.89
60	0.74	3.08	4.51	87.57	95.89
90	0.71	2.81	4.37	88.44	96.33
120	0.52	2.63	4.33	88.44	95.92

Reference

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3. K. Venkatachalam, X. Arzuaga, N. Chopra, V. G. Gavalas, J. Xu, D. Bhattacharyya, B. Hennig and L. G. Bachas, *J. Hazard. Mater.*, 2008, 159, 483-491.