Synthesis of a core-shell magnetic Fe$_3$O$_4$-NH$_2$@PmPD nanocomposite for efficient removal of Cr(VI) from aqueous medium

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† Supplementary information (SI) available: The chemical structure of PmPD and the mass ratio for Cr(VI) and the N-based group are presented.

‡ Hongshan Zhu and Jin Wu contributed equally to this paper.
The chemical structure of mPD and PmPD.

The calculated process for the mass of N

According to the mass ratios of the Fe and N (8.2, 2.6 and 1.2 for 4:1Fe₃O₄-NH₂@PmPDs, 1:1Fe₃O₄-NH₂@PmPDs, and 1:4Fe₃O₄-NH₂@PmPDs, respectively), the mass fraction of the N-based group on the Fe₃O₄-NH₂@PmPDs can be obtained, which is shown in the Table S1. Where \( w(N) \) is the mass fraction of N on the adsorbents; the \( w(-N=) \) is the mass fraction of benzenoid amine groups (-N=) on the adsorbents; the \( w(-NH-) \) is the mass fraction of quinoid imine groups \( w(-NH-) \) on the adsorbents. \( m(Cr) \) is the mass of Cr adsorbed on the adsorbents. \( m(N) \) is the mass of N on the adsorbents. The adsorption isotherms of Cr(VI) on various Fe₃O₄-NH₂@PmPDs and the simulations with Langmuir for 4:1Fe₃O₄-NH₂@PmPDs, 1:1Fe₃O₄-NH₂@PmPDs, 1:4Fe₃O₄-NH₂@PmPDs have been shown in Fig. S2. The correlation coefficients \( (R^2) \) of the Langmuir model indicates that the Langmuir model could satisfactory depict the adsorption process. Then the mass fractions of Cr(VI) adsorbed on Fe₃O₄-NH₂@PmPDs were also investigated shown in Table S1.
Fig. S2. The adsorption isotherms of Cr(VI) on various Fe₃O₄-NH₂@PmPDs (A) and the simulations with Langmuir (B). T=313 K.

Table S1

<table>
<thead>
<tr>
<th>Adsorbents</th>
<th>(m(Fe) : m(N))</th>
<th>(c_{max}) (mg/g)</th>
<th>(m(Fe) : m(N))</th>
<th>(W(N))</th>
<th>(W(-N=))</th>
<th>(W(-NH-))</th>
</tr>
</thead>
<tbody>
<tr>
<td>4:1Fe₃O₄-NH₂@PmPDs</td>
<td>8.2</td>
<td>285</td>
<td>3.86</td>
<td>7.38%</td>
<td>0.89%</td>
<td>6.50%</td>
</tr>
<tr>
<td>1:1Fe₃O₄-NH₂@PmPDs</td>
<td>2.6</td>
<td>610</td>
<td>3.65</td>
<td>16.71%</td>
<td>2.01%</td>
<td>14.70%</td>
</tr>
<tr>
<td>1:4Fe₃O₄-NH₂@PmPDs</td>
<td>1.2</td>
<td>689</td>
<td>2.79</td>
<td>24.68%</td>
<td>2.96%</td>
<td>21.72%</td>
</tr>
</tbody>
</table>