Supporting Information

Synthesis of Surface Ion-Imprinted Magnetic Microspheres by Locating Polymerization for Rapid and Selective Separation of Uranium (VI)

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**Synthesis of Fe₃O₄@SiO₂-C=C microspheres**

A typical process of synthesis of Fe₃O₄ particles was depicted as below ¹: FeCl₃·6H₂O (0.81 g, 3 mmol), CH₃COONa (2.04 g, 24.8 mmol), polyethylene glycol (0.24 g, Mₙ = 2000 g/mol) and sodium dodecyl sulfonate (1.09 g, 3.13 mmol) were dissolved in 25 mL of ethylene glycol under vigorous stirring. Subsequently, the mixture was transferred into a Teflon-lined stainless-steel autoclave. The autoclave was heated at 180 °C and maintained for 6 h. Then, it was cooled to room temperature. The resulting black magnetite particles were washed three times with ethanol and dried in vacuum at room temperature for 12 h.

Fe₃O₄@SiO₂ particles were prepared via a typical process ²: 0.6 g of the as-prepared Fe₃O₄ particles were dispersed in a mixture of ethanol (320 mL), water (80 mL), and NH₃·H₂O (4 mL, 28 wt%) under ultrasonication. Then, 2 mL tetraorthosilicate was added dropwise and the reaction was allowed to proceed at room temperature for 6 h under stirring. Afterwards, the product was washed several times with ethanol and dried in vacuum at room temperature for 12 h.

Fe₃O₄@SiO₂-C=C microspheres were prepared by the modified literature method ³: the as-prepared Fe₃O₄@SiO₂ particles (0.50 g) were suspended in ethanol (70 mL) with the help of ultrasonication. After addition of 3-(methacryloxy)propyltrimethoxysilane (0.5 mL), the mixture was allowed to react at room temperature for 48 h with continuous stirring under argon atmosphere. Then, the product was washed several times with ethanol, and dried in vacuum at room temperature for 12 h to give Fe₃O₄@SiO₂-C=C microspheres.
Figure S1. SEM images of (A) Fe$_3$O$_4$ and (B) Fe$_3$O$_4$@SiO$_2$. (C) FTIR spectra of (a) Fe$_3$O$_4$, (b) Fe$_3$O$_4$@SiO$_2$, and (c) Fe$_3$O$_4$@SiO$_2$-C=C.

Figure S2. XPS spectrum of C 1s of SII-MM1.
Figure S3. Magnetization curves of (a) Fe₃O₄@SiO₂-C=C, and (b) SII-MM1. The left inset shows the magnified magnetization curve of SII-MM1, and the below inset shows the magnetic separation of SII-MM1.

Figure S4. EDX spectra of (A) SII-MM1, (B) SII-MM2, and (C) SII-MM3.
Figure S5. Effect of chemical composition of SII-MM on the adsorption of uranyl ions: (A) SII-MM1, (B) SII-MM2, and (C) SII-MM3. (Experiment condition: 5 mL solution, $10^{-4}$ mol/L uranyl ion, 298.15 K, 0.5 g/L SII-MM.)

Figure S6. Pseudo-first-order kinetics of U (VI) adsorption by SII-MM (A) and SNI-MM (C), and pseudo-second-order kinetics of U (VI) adsorption by SII-MM (B) and SNI-MM (D).
**Table S1.** Surface area of different samples.

<table>
<thead>
<tr>
<th>Sample*</th>
<th>BET Surface Area (m²/g)</th>
</tr>
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<tbody>
<tr>
<td>SII-MM1</td>
<td>16.23</td>
</tr>
<tr>
<td>SII-MM2</td>
<td>15.85</td>
</tr>
<tr>
<td>SII-MM3</td>
<td>9.41</td>
</tr>
<tr>
<td>SNI-MM</td>
<td>9.67</td>
</tr>
</tbody>
</table>

* Surface ion-imprinted magnetic microspheres with different content of 1-vinylimidazole: 0.2g, 0.1g and 0.05g for SII-MM1, SII-MM2, and SII-MM3, respectively; SNI-MM is surface non-imprinted microspheres with the same recipe of SII-MM1.

**Figure S7.** Adsorption isotherms of uranium (VI) on SII-MM1. The scattered points represent experiment data, and the dashed lines represent the Freundlich model and the solid lines represent the Langmuir model.
Figure S8. (A) TEM image of the core-shell structure of SII-MM1 with uranium (VI) on the surface; and elemental mappings of (B) Si, (C) O and (D) U. In elemental mapping, the brighter, the more elemental content.

Reference

