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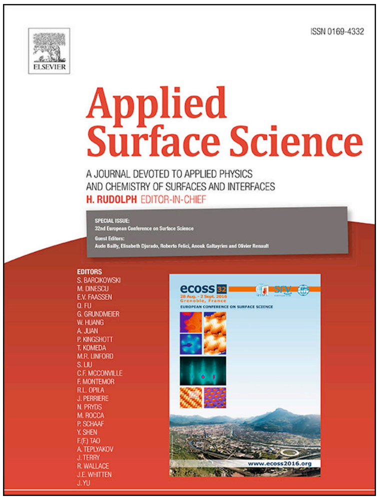

Full Length Article

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Effect of Fe_3O_4@PDA morphology on the U(VI) entrapment from aqueous solution

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Abstract: In this work, two kinds of core-shell Fe_3O_4@PDA materials with different morphologies were successfully prepared by a simple *in situ* polymerization method based on two kinds of pristine Fe_3O_4 spheres, which were obtained by hydrothermal method. Among the four obtained samples, Fe_3O_4@PDA porous nano-spheres (MNS-4) have the best U(VI) entrapment performance, which can not only be owing to the structure characteristics (higher porosity and lower density) but also to the PDA shell with large amount of functional groups. Additionally, the maximum removal capacity of MNS-4 for U(VI) entrapment can be of 193.27 $mg \cdot g^{-1}$ at 298 K, which exceeds the adsorption capacity of most other reported magnetic materials. Moreover, the solution pH values have a significant effect on the adsorption performance of the adsorbents for U(VI) pre-concentration while that originated from ionic strength can be negligible, suggesting that the adsorption process can be achieved through inner-sphere surface complexation. Thermodynamic studies reveal that the U(VI) adsorption process is exothermic and spontaneous. The analysis of adsorption mechanism indicates that U(VI) pre-concentration process can be achieved by the interactions between –OH groups, pyridinic N and C–NH_2 and U(VI). This work not only offers a new point of synthesizing undertaking adsorbents with targeting structures, but also provides a facile and versatile approach towards designing Fe_3O_4-based hybrid materials for their potential environmental applications.

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