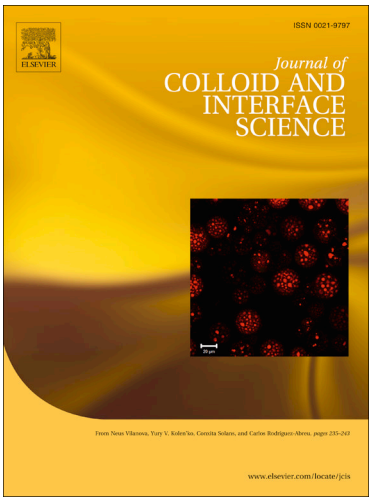


Regular Article

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# Highly enhanced adsorption performance of U(VI) by non-thermal plasma modified magnetic $Fe_3O_4$ nanoparticles

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**Abstract:** In this study, magnetic $Fe_3O_4$ nanoparticles (MNP) modified with O-phosphorylethanolamine (O-PEA) were successfully prepared by non-thermal plasma induced method with different treatment times. The raw and modified MNP were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM), Fourier transform infrared spectrophotometer (FT-IR), and vibration sample magnetometer (VSM). The modified MNP samples show higher adsorption capacity for U(VI) removal and longer treatment time results in higher adsorption capacity and efficiency. The experimental parameters were optimized by means of the response surface methodology to improve the removal efficiency of U(VI) by the modified adsorbents from aqueous solutions. The O-PEA modified MNP with 120 min treatment time shows the highest adsorption capacity with 228.17 $mg \cdot g^{-1}$ among the five samples at 293.15 K. Thermodynamic studies reveal that the adsorption process of U(VI) onto O-PEA modified MNP is endothermic and spontaneous. XPS studies indicate that the U(VI) removal is fulfilled through the binding interactions between U(VI) and $–NH_2$, –OH and phosphate groups on the modified MNP surface. This work not only provides a simple, convenient and cost-effective way for water treatment by plasma modification, but also provides a new insight into preparing promising adsorbents to achieve magnetic separation from aqueous solution.