

Efficient Pre-Concentration of As (III) Using Guanidine-Modified Magnetic Mesoporous Silica in the Food Sample

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Abstract : An efficient magnetic mesoporous structure was designed and prepared for the facile pre-concentration of As(III) ions. To prepare the sorbent, a core-shell magnetic silica nanoparticle was covered by MCM-41 like structure, and then the surface was modified by guanidine via an amine linker. The prepared adsorbent was investigated as an effective and sensitive material for the adsorption of arsenic ions from the aqueous solution applying a normal batch method. The imperative variables of the adsorption were studied to increase efficiency. The dynamic and static processes were tested that matched a pseudo-second order of kinetic model and the Langmuir isotherm model, respectively. The sorbent reusability was investigated, and it was confirmed that the designed product could be applied at best for six cycles successively without any significant efficiency loss. The synthesized product was tested to determine and pre-concentrate trace amounts of arsenic ions in rice and natural waters as a real sample. A desorption process applying 5 mL of hydrochloric acid (0.5 mol L^{-1}) as an eluent exhibited about 98% recovery of the As(III) ions adsorbed on the GA-MSMP sorbent.

Keywords : arsenic, adsorption, mesoporous, surface modification, MCM-41

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