

Rapid magnetic microextraction to preconcentrate and determinate cadmium from environmental samples

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A novel and greener ultrasonically assisted/modified cloud point extraction procedure for the preconcentration and extraction of trace cadmium from environmental samples was developed. The sorbent material was fabricated by scattering of magnetic iron nanoparticles (MNPs) over graphene oxide (GO) to obtain magnetic graphene oxide (MGO). The material was suspended in the ionic liquid 1-n-butyl-3-metilimidazolium tetrafluoroborate [BMIM][BF₄]. The obtained stable colloidal suspension is named ferrofluid. GO presents excellent adsorbent properties for organic species due to the presence of the electronic π system. For this reason, the organic ligand [1,5-bis-(2-dipyridyl) methylene] thiocarbonohydrazide (DPTH) was used in order to form an organic complex of Cd. Once the DPTH ligand has been added to sample, the ferrofluid was injected and finely dispersed in the sample solution in order to extract the formed chelate as shown in Fig. 1. The complete adsorption of the quelate took place within few seconds, after that the solid was separated from the solution with the aid of a strong magnet. Cadmium ions were desorbed from the material with 1 mL of 5% acid nitric solution and quantified by electrothermal atomic absorption spectrometry (ETAAS).

The main parameters affecting the extraction and the furnace program were optimized using one-at-time method. The analytical performance under optimum conditions are the following: LOD: 0.005 $\mu\text{g/L}$, LOQ: 0.017 $\mu\text{g/L}$. Linear calibration: 0-0.25 $\mu\text{g/L}$ and EF: 200. The reliability of the developed procedure was tested by relative standard deviation (% RSD), which was found to be < 5% (1.3%). The performance of the proposed procedure was checked by applying to certified reference material and spiking standard in real samples.

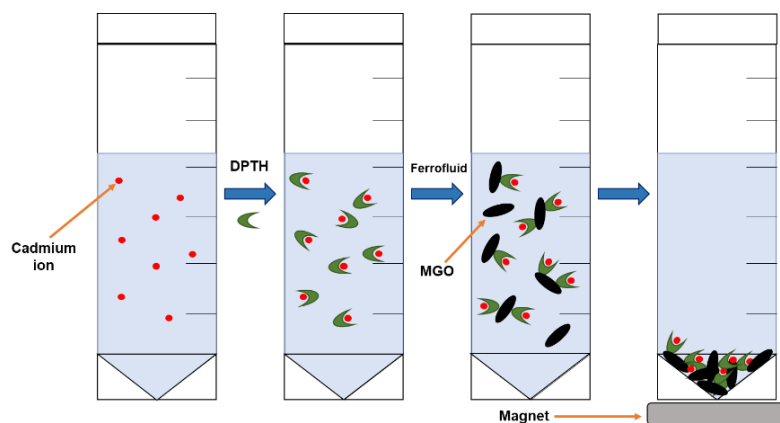


Fig. 1 Magnetic solid phase extraction process.

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