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Switchable solvent based liquid phase microextraction of trace lead and cadmium from environmental and biological samples prior to graphite furnace atomic absorption spectrometry detection

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ABSTRACT: A switchable hydrophilicity solvent (SHS) based liquid phase microextraction (LPME) method was proposed for the preconcentration of trace Pb (II) and Cd (II) followed by graphite furnace atomic absorption spectrometry (GFAAS) detection. The SHS of protonated triethylamine carbonate (P-TEA-C) was synthesized and applied as the extractant, which is environmentally friendly and low cost. Pb (II) and Cd (II) in ammonium pyrrolidine dithiocarbamate (APDC) complex form was extracted into the triethylamine (TEA) phase by converting P-TEA-C to TEA. The vortex led to the rapid formation of fine droplets of the extractant in the aqueous solution, and enlarged contact surface between both immiscible liquids. The factors affecting the microextraction procedure, including sample pH, APDC concentration, volume of SHS and NaOH, sample volume and matrix effect were investigated. Under the optimal conditions, enrichment factor of 50 was achieved with consumption of 10 mL aqueous sample, and detection limits of 16 and 3.9 ng L⁻¹ were obtained for Pb (II) and Cd (II), respectively. The accuracy of the proposed method was validated by the analysis of Certified Reference Materials of GSBZ50009-88 environmental water, GBW07605 tea and GBW07601(GSH-1) human hair. The method was also successfully applied for determination of Pb (II) and Cd (II) in water, tea and human hair samples.

Key words: switchable hydrophilicity solvent; liquid phase microextraction; triethylamine; lead and cadmium; tea; human hair

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