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Ultrasound assisted-ionic liquid-dispersive-micro-solid phase extraction based on modified multi-walled carbon nanotube for pre-concentration of mercury ions in waste water samples

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Mercury is a ubiquitous element and is one of the most toxic environmental pollutants. Due to high toxicity and bioaccumulation factor, the accurate determination of Hg (II) ions has been increasingly necessary to study problems associated with environmental water pollution. In the present work, ultrasound assisted-ionic liquid-dispersive-micro-solid phase extraction (US- IL-D-µ-SPE) based on phenyl sulfonic acid functionalized multi-walled carbon nanotube (MWCNT-Ph-SO3H) was developed as a new and simple method for rapid pre-concentration and extraction of ultra-trace Hg (II) ions from natural water samples. In this method, a mixture of MWCNT-Ph-SO3H as a nanoadsorbent, a hydrophobic ionic liquid and acetone as a binary solution was rapidly injected into a sample solution containing Hg (II) ions at optimized pH. After ultrasonication and centrifugation, Hg (II) ions were complexed by sulfonate group of the adsorbent, trapped in the IL phase, and simply separated from the aqueous phase. Finally, the Hg (II) concentration of the eluent was determined with flow injection-cold vapor-atomic absorption spectrometry (FI-CV-AAS). All main factors for the quantitative recoveries of Hg (II) ions as well as effect of matrix ions were investigated. The developed method showed quantitative recoveries of mercury ions (> 98%) with detection limit of 15 ng L−1 and enrichment factor of 9.9 (RSD < 3.6%). The developed US-IL-D-µ-SPE is a highly sensitive technique and it has been successfully used as a rapid, simple, cost-effective and green method for determination of Hg (II) ions in real water and wastewater samples.

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