ULTRASOUND-ASSISTED EMULSİFİCATİON MICROEXTRACTION METHOD BASED ON APPLYING LOW DENSITY ORGANIC SOLVENTS FOLLOWED BY GC-FID FOR DETERMINATION OF PAHS IN WATER SAMPLES

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The application of ultrasonic radiation in LLE methods (USALLE) has been reported by Luque de Castro et al. [1]. High extraction efficiency in a short period of time is the main advantages of USALLE. Regueiro et al. applied a miniaturized approach to USALLE by using a micro volume of organic phase to provide the advantages of both dispersive liquid-liquid microextraction (DLLME) and USALLE [2]. The required times for emulsification in USAEME method are in the range of 5-10 min. These times are significantly higher than the time needed to disperse organic solvent in DLLME method. Also, in both USAEME and DLLME due to difficulty of collection of micro volumes of flouted organic solvent, the selected extracting solvent must be denser than aqueous samples.

In the present work, a fast, simple and efficient ultrasound assisted emulsification microextraction (USAEME) method was successfully developed based on applying low density organic solvents. In this study micro volumes of toluene were injected into a 12 mL home-designed extraction-centrifuge glass vial containing aqueous sample. The injection was performed slowly during 30 sec while the vial had been placed in a switched on ultrasonic water bath. The emulsion was centrifuged and 2 μL of separated toluene was injected into a gas chromatographic instrument equipped with flame ionization detector (GC-FID) for analysis. Some polycyclic aromatic hydrocarbons (PAHs) were selected as model compounds for developing and evaluating of the method performance and to compare the proposed method with other developed techniques. Several factors influencing the emulsification, extraction and collection efficiency such as the nature and volume of organic solvent, emulsification-extraction temperature, ionic strength, equilibrium time and centrifugation time were investigated and optimized. Under the optimum conditions, preconcentration factors (PFs) at the range of 1776 to 2714 were obtained. The performance of this method was studied in terms of linear dynamic range (LDRs from 0.05 μg L⁻¹ up to 100 μg L⁻¹), linearity (R² ≥ 0.994), precision (repeatability ≤ 7.9%, reproducibility ≤ 14.6%) and extraction percents (59.2 to 90.5%). Limits of detections (LODs) were at the range of 0.02 to 0.05 μg L⁻¹ for different PAHs. The applicability of the proposed method was evaluated by extraction and determination of PAHs in some natural water samples.

References