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Gas chromatography-mass spectrometry determination of polycyclic aromatic hydrocarbons in water coupled with electroflotation-assisted emulsification liquid–liquid microextraction

Krylov V. A
N. I. Lobachevsky Nizhny Novgorod State University, Russia

Abstract:

Polycyclic aromatic hydrocarbons are priority pollutants due to the very high toxicity. Therefore, to determine them, it is necessary to use sensitive methods with preconcentration. In the present study, a novel method named electro flotation-assisted emulsification liquid–liquid microextraction combined with GC-MS analysis has been proposed for the preconcentration and determination of polycyclic aromatic hydrocarbons in water samples. The advantage of electro flotation demassification is the ease of changing the gas flow and size of gas micro-bubbles. The formation of gas micro-bubbles occurs on platinum electrodes soldered into a glass concentrator. Hexane, toluene and o-xylene were used as extract ants. Application of extract capillary collection have solved the problem of the light extractant sampling. Dispersion of the extractant was performed by ultrasound. The volume of micro extracts was 7-10 µl. The recovery of polycyclic aromatic hydrocarbons from water was 62-95%. A DB-5 (5% phenyl + 95% polydimethylsiloxane) fused-silica capillary column (30 m ×0.25 mm i.d. and 0.25-µm film thickness)was applied for separation of the analytes. The limits of detection and quantification of polycyclic aromatic hydrocarbons achieved were at the level of 10-5–10-6 mg/L and highly competitive with the best world results. The methods of accounting or elimination of systematic errors are proposed. Purification of solvents by Rayleigh distillation method allowed to obtain samples with impurity content lower than (1-4)· 10-3 mg/L. The expanded uncertainty of determination was calculated. It included precision, uncertainty of standards preparation, calibration, sample introduction, enrichment factor. The relative expanded uncertainty was at the level of 13-30%.

Biography:

Krylov V. A. has completed his PhD from Gorkiy State University, Russia. He is head of the division of analytical chemistry of the Nizhny Novgorod State University. The main direction of scientific research of professor Krylov is the development of the theory and applications of chromatography for the analysis of high purity substances, environmental objects and development of methods of the microextraction. He has over 200 scientific papers, including reviews on the analytical chemistry of air, high purity volatile substances and liquid-liquid microextraction. He presented papers in more than 50 russian and international conferences.

Speaker Publications:

1 "Determination of impurity composition of high-purity germane enriched with 74Ge isotope using gas chromatography-mass spectrometry method", Analytics and control/ Vol 21, No 1 (2017)

2. "Gas chromatographic determination of benzothiophenes in high-purity sulfur", Journal of Analytical Chemistry/Vol 72 Issue 6:639-643

3. "Highly Sensitive Chromatography Mass Spectrometry Determination of Impurities in High-Purity Monogermane Using Adsorption Capillary Column with Carbon Sorbent", Inorganic Materials/Vol 53 Issue 14:1386-1390

4. "Gas-Chromatographic Analysis of High-Purity Phosphorus Oxychloride with the Microextraction Preconcentration of Impurities" Journal of Analytical Chemistry/ Vol 75 Issue 7:936-940

5. Gas chromatographic-mass spectrometric analysis of high purity sulfur hexafl uoride enriched with 32S isotope", Analytics and control/ Vol 20, No 1 (2016)

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