DETERMINATION OF POLYCYCLIC AROMATIC HYDROCARBONS IN COSMETICS BY STIR BAR SORPTIVE DISPERSIVE MICROEXTRACTION AND GAS CHROMATOGRAPHY-MASS SPECTROMETRY

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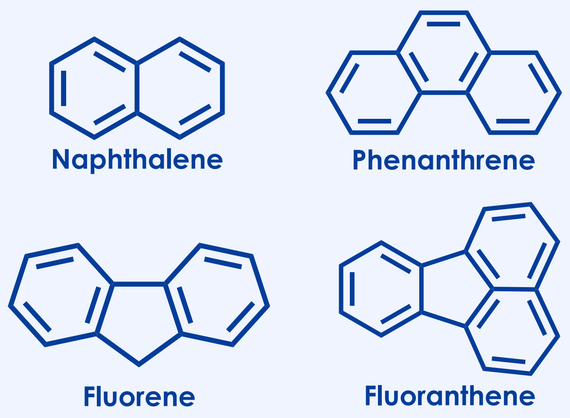
INTRODUCTION

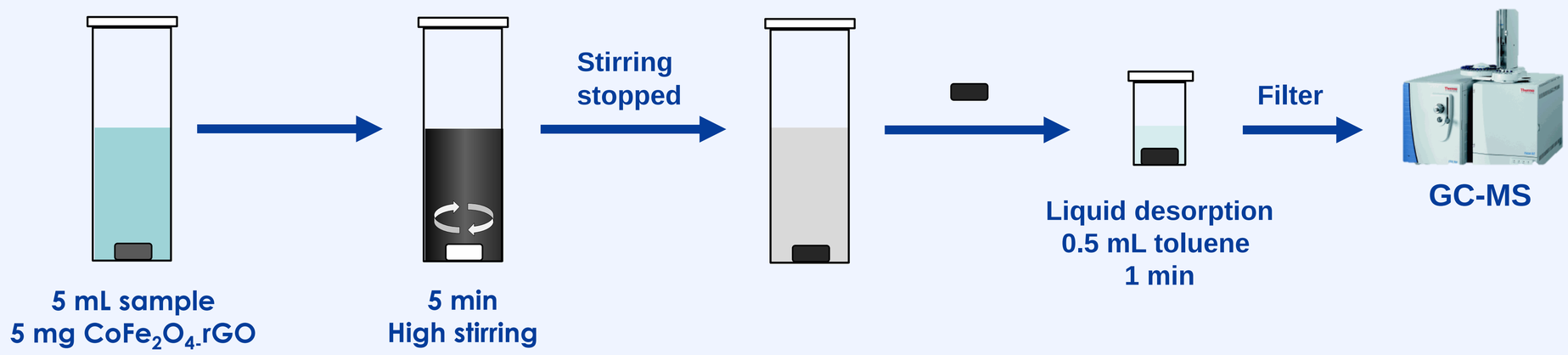
AIM

In this work, a fully optimized method for the determination of **ten** volatile **polycyclic aromatic hydrocarbons (PAHs)** in **cosmetics products** is presented

- It is well-known that PAHs are hazardous for human health due to their endocrine disrupting properties and carcinogenic effects. In consequence, the European Regulation on Cosmetic Products forbids the presence of some PAHs
- **Stir bar sorptive dispersive microextraction (SBSDME)** [1] is a hybrid microextraction approach (stir bar sorptive extraction (SBSE) plus dispersive solid phase extraction (DSPE)) where a **magnetic material ($CoFe_2O_4$-rGO)** used as extraction phase is dispersed by magnetic stirring and retrieved onto the stir bar surface due to its magnetic properties
- The analytes are desorbed by liquid desorption (LD) and subsequently subjected to GC-MS



EXPERIMENTAL



GC-MS conditions

- Injection volume: 2 µL
- Inlet temperature: 280 °C
- Transfer line temperature: 280 °C
- Ion source temperature: 250 °C
- Helium flow rate: 1 mL min^{-1}
- Column: HP-5MS (30 m x 0.25 mm, 0.25 µm)

RESULTS AND DISCUSSION

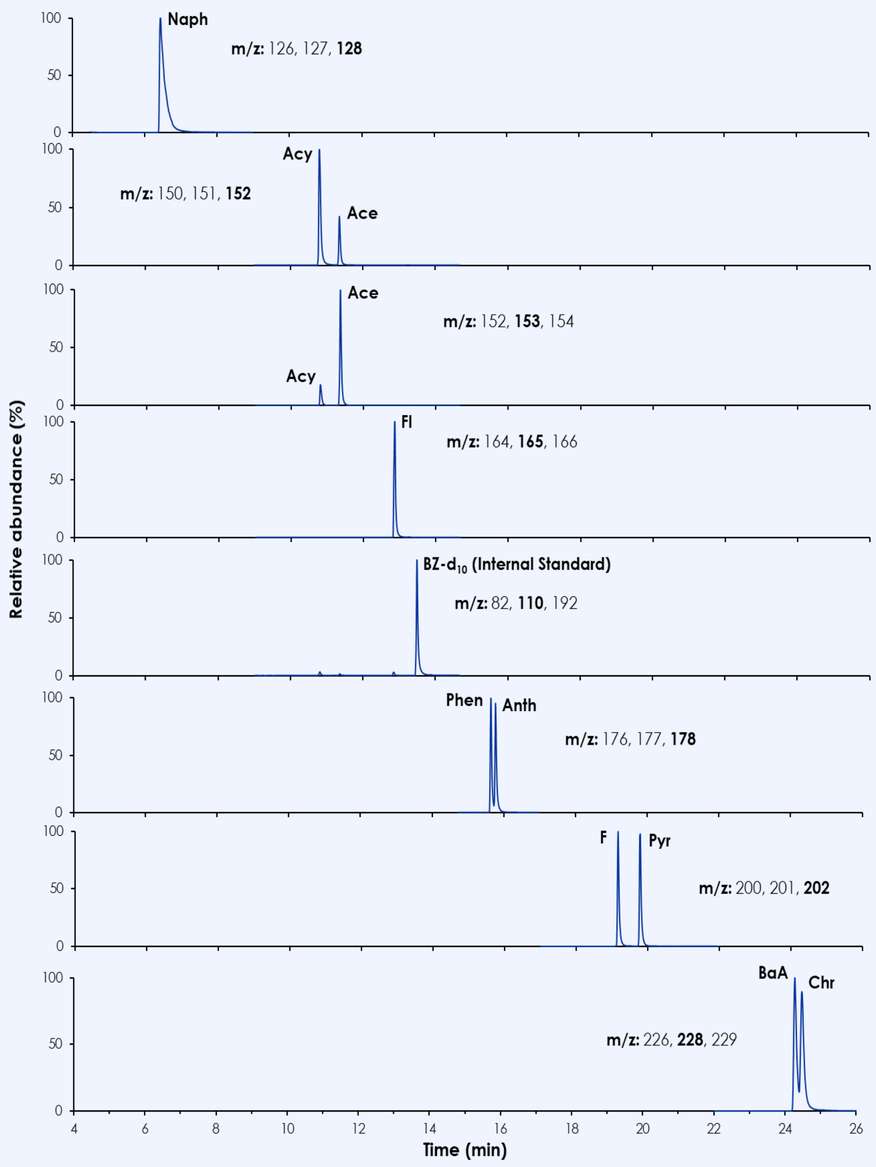
Figures of merit of the proposed method

PAH	EF	LOD (ng mL^{-1})	LOQ (ng mL^{-1})	MLOD (ng g^{-1})	MLOQ (ng g^{-1})	Repeatability (%RSD)			
						Intra-day		Inter-day	
						10 (ng mL^{-1})	25 (ng mL^{-1})	10 (ng mL^{-1})	25 (ng mL^{-1})
Naph	4	0.3	1.1	3.5	11.7	7.7	0.3	11.1	13.5
Acy	3	0.8	2.6	8.1	26.9	7.5	7.1	4.4	1.2
Ace	2	1.3	4.3	14.1	46.6	6.5	8.6	14.4	7.3
Fl	5	0.7	2.3	7.4	24.5	10.3	6.7	2.1	14.5
Phen	8	0.3	1.1	3.5	11.7	4.9	13.8	8.4	5.0
Anth	8	0.4	1.2	3.9	13.0	3.5	14.8	7.5	5.3
F	5	0.3	1.0	3.4	11.1	12.6	14.1	13.9	14.1
Pyr	5	0.2	0.8	2.7	8.8	18.2	8.6	11.5	9.3
BaA	1	1.8	5.8	18.9	62.3	-	3.1	-	10.3
Chr	1	1.9	6.2	20.3	67.1	-	0.4	-	14.6

- High level of linearity, that reached at least 125 ng mL^{-1}, was obtained for all compounds
- Low limits of detection (0.3 - 1.9 ng mL^{-1}) and good values of precision (< 15 %) and enrichment factors (1 - 8) were achieved

Analysis of real samples

- Slopes of each analyte in both conventional and standard addition calibration were compared. Standard addition calibration was recommended for the analysis of cosmetic samples to correct the matrix effect
- This method was applied to two commercial cosmetic products: a body moisturizer and a cleansing milk
- Only naphtalene (Naph) and acenaphthylene (Acy) were found in cosmetic samples. The body moisturizer sample contained 176 ± 10 ng g^{-1} of Naph and the cleansing milk contained 40 ± 7 and 24 ± 2 ng g^{-1} of Naph and Acy, respectively



Chromatogram of a standard solution containing the target analytes at 1 mg L^{-1} obtained by the developed method

CONCLUSIONS

- A fully optimized SBSDME-LD-GC-MS method that contributes to the development of sensitive methods for the determination of PAHs in cosmetic products at trace level has been presented
- The proposed approach offers simplicity, rapid analysis time and satisfactory analytical features

[1] J.L. Benedé, A. Chisvert, D.L. Giokas, A. Salvador, J. Chromatogr. A 1362 (2014) 25-33

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Consulta otras comunicaciones presentadas por el GICAPC en la **XXII Reunión de la Sociedad Española de Química Analítica:**

Determination of nitro musks in environmental waters by stir bar sorptive dispersive microextraction followed by thermal desorption-gas chromatography-mass spectrometry. J.L. Benedé, A. Chisvert, A. Salvador. Flash Communication. Ver comunicación.

Stir bar sorptive-dispersive microextraction mediated by a magnetic nanoparticles-metal organic framework composite for the determination of n-nitrosamines in cosmetic products. P. Miralles, I. Van Gemert, A. Chisvert, A. Salvador. Flash Communication. Ver comunicación.

Development of an analytical method for the determination of acrylamide in cosmetic products based on dispersive liquid-liquid microextraction. L. Schettino, J.L. Benedé, A. Chisvert, A. Salvador. Flash Communication. Ver comunicación.

Determination of hydroxylated ingredients with preservative activity in cosmetic products by gas chromatography-mass spectrometry. C. Azorín, J.L. Benedé, A. Chisvert, A. Salvador. Ver comunicación.

A green analytical method for the determination of hydroxyethoxyphenyl butanone in cosmetic products. P. Miralles, J.L. Benedé, A. Mata-Martín, A. Chisvert, A. Salvador. Ver comunicación.

Determination of polycyclic aromatic hydrocarbons in cosmetics by stir bar sorptive dispersive microextraction and gas chromatography-mass spectrometry. Vállez-Gomis, J. Grau, J.L. Benedé, A. Chisvert, A. Salvador. Ver comunicación.

Reversed-phase dispersive liquid-liquid microextraction prior to liquid chromatography-tandem mass spectrometry for the determination of acrylamide in cosmetic products. L. Fernández, J.L. Benedé, A. Chisvert, A. Salvador. Ver comunicación.

Development of dispersive liquid-solid microextraction: application to the determination of cortisone and cortisol in human saliva. J. Grau, J.L. Benedé, A. Chisvert, A. Salvador. Ver comunicación.