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# Solvent-free method for the determination of polynuclear aromatic hydrocarbons in waste water by solid-phase microextraction–high-performance liquid chromatography with photodiode-array detection

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## Abstract

Solid-phase microextraction (SPME) has rapidly been established among the practical alternatives for sample preparation for gas chromatography. Nevertheless polynuclear aromatic hydrocarbons (PAHs) are more effectively monitored by high-performance liquid chromatography (HPLC), but initially, there was no simple way to introduce analytes extracted by SPME into an HPLC system. A SPME–HPLC interface was developed by Supelco, which enables one to take advantages of the time and solvent savings offered by SPME. In the present work six PAHs from the European Union directives: fluoranthene, benzo[*b*]fluoranthene, benzo[*k*]fluoranthene, benzo[*a*]pyrene, benzo[*ghi*]perylene, indeno[1,2,3-*cd*]pyrene were evaluated after optimization of a sample preparation method with a 100- $\mu$ m poly(dimethylsiloxane) fiber. Repeatability, reproducibility, correlation coefficients, linearity, recoveries and limits of detection were determined and are indicated. © 1998 Elsevier Science B.V. All rights reserved.

**Keywords:** Water analysis; Environmental analysis; Solid-phase microextraction; Sample preparation; Polynuclear aromatic hydrocarbons

## 1. Introduction

Polynuclear aromatic hydrocarbons (PAHs) are ubiquitous environmental pollutants, which present a potential health concern because their toxicity, mutagenicity and carcinogenicity in animals [1,16]. In 1976 the European Union (EU) listed 132 dangerous substances of target analytes that should be monitored as dangerous substances unloaded into the aquatic environment [2]. In this context it is fundamental to develop analytical methods and improve sample preparation techniques, so that this

directive could be respected and that human health can be protected. Today classical extraction techniques are useless and solid-phase extraction (SPE) has become the sample preparation technique of choice [10,14,15]. More recently a new extraction technique appeared – solid-phase microextraction (SPME) – which integrates sampling, extraction, concentration and sample introduction, in a single step [3]. This new technique constitutes a new environmental chemistry philosophy as this phasing out of the solvent is expected to induce a major change in analytical methodology [4] and also allows for the scientific community formulate new and practical alternatives to the known sample preparation methods. SPME consists of two processes: first, the partitioning of the analytes between the coating

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