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# Comparison of three different poly(dimethylsiloxane)–divinylbenzene fibres for the analysis of pesticide multiresidues in water samples: structure and efficiency

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## Abstract

Despite the continuing development of SPME (solid-phase microextraction) fibre coatings, their selection presents some difficulties for analysts in choosing the appropriate fibre for a certain application. There are two distinct types of SPME coatings available commercially. The most widely used are poly(dimethylsiloxane) (PDMS) and poly(acrylate) (PA). Supelco has developed new mixed phases consisting of porous polymer particles, either poly(divinylbenzene) (DVB) or Carboxen suspended in a matrix of PDMS or Carbowax for extracting analytes via adsorption. In addition to the nature of the extracting phase, the thickness of the polymeric film must be taken into account and, surprisingly, the construction of the fibres when apparently they bear the same coating, as it is the case of the three PDMS–DVB fibres available. Other fibre structure properties not well explored were identified and must be taken into consideration. To elucidate their extraction efficiency, three PDMS–DVB fibres, namely 60  $\mu\text{m}$  for HPLC use, 65  $\mu\text{m}$  for GC use and 65  $\mu\text{m}$  StableFlex for GC use, were compared with regard to the extraction of 36 compounds included in four pesticide groups. The first was particularly suited for the extraction of organophosphorus pesticides and triazines whereas the StableFlex exhibited advantages in the analysis of organochlorine pesticides and pyrethroids. An explanation for the extraction differences is suggested based on the different structure of the fibres. Detection limits in the range of 1–10 ng/l for organochlorine pesticides, 1–30 ng/l for organophosphorus pesticides, 8–50 ng/l for triazines and 10–20 ng/l for pyrethroids were attained in a method using the 60  $\mu\text{m}$  PDMS–DVB fibre. The fibre maintains its performance at well above 100 extractions with between-day precision below 10%. © 2002 Elsevier Science B.V. All rights reserved.

**Keywords:** Water analysis; Solid-phase microextraction; Pesticides; Organochlorine compounds; Organophosphorus compounds; Pyrethroids; Triazines

## 1. Introduction

Solid-phase microextraction (SPME) was first developed in 1989 at the University of Waterloo (Ontario, Canada) by Pawliszyn and co-workers and

has been marketed since 1993 by Supelco. Since then the technique has grown enormously [1].

It can integrate sampling, extraction, concentration and sample introduction into a single uninterrupted process, resulting in high sample throughput. Its important features are its simplicity, low cost, rapidity, selectivity and sensitivity when combined with appropriate detection modes [1–3]. SPME has been applied to analyses in various fields, such as en-

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