ABSTRACT

Charles University, Faculty of Pharmacy in Hradec Králové	
Training Workplace	Department of Analytical Chemistry
Doctoral Degree Program	Pharmaceutical Analysis
Candidate	Mgr. Slavomíra Zatrochová
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Title of Doctoral Thesis	Advanced extraction materials for sample preparation in chromatographic analysis

The submitted dissertation presents an annotated set of publications focusing on advanced extraction materials in analytical chemistry and their prospective use as sorbents in sample preparation prior to HPLC analysis. The work was created based on the cooperation with the Technical University of Liberec and the University of Valencia in Spain.

In the first part, a new sorbent based on a hybrid monolith with a metal-organic framework (MOF) was developed for conventional Teflon-coated magnetic stir bars, and the resulting hybrid monolith was evaluated as a stir bar sorptive extraction (SBSE) sorbent for the extraction of estrogens in water and urine samples.

In the second part, the work was focused on nanofibrous and microfibrous polymers and the production of fibers by alternating current (AC) electrospinning.

The extraction efficiency, selectivity and stability of different polymer nanofibers were tested. The extraction process involved preconcentration of the analytes using a compact nanofiber disk freely vortexed in the analyzed sample. After extraction, the disk was subjected to elution in an HPLC vial. This innovative approach avoided the undesirable problems associated with manual handling typical of conventional SPE, as the extraction was performed directly in the vial. Other advantages are no evaporation of the sample, no reconstitution, and no pipetting. In addition, this process prevents the generation of disposable plastic waste.

Furthermore, the work was devoted to the research of the electrospinning method using alternating current (AC) electrospinning and direct current (DC) electrostatic spinning, which was used to produce nanofibrous material as a sorbent for extraction. The possibilities of AC electrospinning of polyamide 6 (PA 6) material were compared with nanofibers produced from the same polymer by conventional DC electrospinning and the suitability of their use for on-line extractions in high-pressure chromatography systems was compared.