

ABSTRACT

Charles University, Faculty of Pharmacy in Hradec Králové

Training Workplace Department of Analytical Chemistry

Doctoral Degree Program Bioanalytical Methods

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Title of Doctoral Thesis Modern extraction techniques in connection with HPLC for analysis of contaminants

A compilation of six publications is presented in this dissertation thesis. The work focuses on applying and comparing extraction sorbents to analyze contaminating substances in food and food supplements. The main aim of this thesis was to present micro and nanofibers as suitable extraction sorbents for use in analytical chemistry. For this purpose, the fibers were compared with other, mostly commercial, extraction sorbents suitable for the type of matrix tested. All experiments were carried out in the on-line connection of the extraction sorbent through the selection valve with the analytical column in the chromatographic system. A crucial part was also the use of the extraction properties of nanofibers for the analysis of real-life samples.

In the first part, the extraction efficiency was studied on liquid matrices, where no need for complex matrix purification was required. The main aim was sufficient retention and preconcentration of analytes. For this purpose, commercial C18 pre-column and molecularly imprinted polymers were selected for comparison with nanofibers for the treatment of the matrix of Tokaj wine before the determination of mycotoxins. The knowledge was subsequently used to test fibers in complex matrices, such as bovine milk and plant-based beverages, which contain many other substances. With these matrices, removing a large amount of interfering macromolecular substances was also necessary while simultaneously retaining the analytes. These properties then make nanofibers promising sorbents even for complex matrices.

A wide portfolio of the fibers has been tested in an extensive study. Part of this comparative study was to test neat fibers of different types of fabrication as well as the fibers functionalized by oxidized graphene, polyphenols or hybrid fibers with graphene admixture. This part of dissertation thesis tested the wider possibilities of their use in environmental analyses or the analysis of biological samples.