

ABSTRACT

Department: Department of Analytical Chemistry

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Title of the diploma thesis: Modification of nanofibers for extraction in liquid chromatography

The diploma thesis demonstrates the influence of modifications of polymer nanofibers on their extraction properties for extraction in liquid chromatography. Nanofibers represent a potential sorbent for extraction methods due to their large surface area, which leads to increased capacity of extraction. Another advantage of nanofibers is the possibility to modify their surface resulting in various nanofibers with different extraction properties. In this thesis, the modifications were performed by coating polypropylene nanofibers with a polydopamine layer. The polymerization solution was pumped through a column, in which the nanofibers were placed, using a peristaltic pump connected to the column by a system of tubes. An on-line SPE HPLC method was developed to determine the extraction properties of the modified nanofibers. Chlorogenic acid was chosen as the model analyte, because its extraction is affected by the polydopamine layer. The key parameters of the coating process were optimized, including the weight of the nanofibers, the concentration of dopamine in the polymerization solution, the flow rate of polymerization solution and the duration of the process. The coating process leading to nanofibers with optimal extraction properties lasted 1 hour. It represents a significant time reduction compared to previously published protocols, in which the nanofibers were coated by simply immersing in the polymerization solution for 4 to 24 hours. Subsequently, the sufficient repeatability of the whole process using optimal parameters was confirmed. It was proven that extraction of chlorogenic acid was affected by the polydopamine layer. Using unmodified nanofibers, the extraction was minimal. Adequate repeatability of the coating process using optimal parameters was not achieved, when the process was applied on nanofibers manufactured from other polymers, namely polycaprolactone and polyethylene.