

# ABSTRACT

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Title of Doctoral Thesis **Development of methods for sensitivity enhancement in capillary zone electrophoresis of natural polyphenolic compounds with use of online electromigration preconcentration techniques**

The thesis presented is dealing with the development of capillary zone electrophoresis (CZE) with UV detection for the sensitivity enhancement in the analysis of polyphenolic substances of natural origin. Basic principles of capillary electrophoresis, different online preconcentration techniques (including stacking) and corresponding instrumentation are discussed in the theoretical part. Moreover a survey of properties of polyphenolic compounds and of herbal drugs containing such substances is presented in this section.

The experimental part is focused on the development and validation of three new analytical procedures with online electrophoretic preconcentration for the assay of polyphenols in plant extracts. The analytes under study were ferulic, chlorogenic, caffeic, p-coumaric, rosmarinic, carnosolic, cinnamic, protocatechuic, vanillic and syringic acid and a group of flavonoids involving quercitrin, quercetin, apigenin, luteolin and rutin.

1. Capillary isotachopheresis and capillary zone electrophoresis (ITP - CZE) in column coupling configuration was developed for the analysis of five phenolic acids and quercitrin in methanolic extract of crude drug of *Melissae herba*. Substantial improvement in the sensitivity of the method with detection limits in the range 18-35 ng/mL was achieved.
2. The technique of large volume sample stacking with polarity switching (LVSS - CZE) in a single capillary for preconcentration and determination of four flavonoids and four phenolic acids in methanolic extract of *Orthosiphonis folium* was devised. A 90-fold enhancement in sensitivity compared to the conventional CZE method was achieved. Detection limits ranged from 3 to 16 ng/mL.
3. Technique based on the combination of transient isotachopheresis induced by sample composition (t-ITP) and capillary zone electrophoresis (t-ITP - CZE) in the single column arrangement was utilized for the analysis of seven phenolic acids in a nutritional supplement (ethanolic extract of herbal drug *Epilobi herba*). A 70-fold enhancement of sensitivity compared to conventional CZE (detection limits ranging from 16 ng/ml to 31ng/ml of an analyte) was reached.