Abstract

Non-covalent interactions participate in majority of processes in living organisms. The strength of interaction between (bio)molecules can be characterized by binding constants of respective complexes, which can be determined by variety of physico-chemical methods. From these methods, capillary electrophoresis features several advantages: (1) interactions takes place in aqueous solutions between free molecules without necessity of their immobilization, (2) short analysis time, (3) small consumption of analyzed compounds, and (4) easy automation of analyses.

Within this dissertation thesis, methods of partial-filling affinity capillary electrophoresis (PF-ACE) were developed for study of interactions between double-strand DNA oligonucleotides and well characterized intercalator ethidium bromide as a model compound. Subsequently, binding constants of oligophenylene derivatives complexes with DNA oligonucleotides were determined.

The PF-ACE method was optimized for study of enantioselective interactions between helquats and selected chiral acidic aromatic analytes. Several compounds whose enantiomers were separated using helquats as chiral selectors were identified.

Capillary electrophoresis was applied as a separation analytical method for monitoring of peptide substrate cleavage by rhomboid proteases. The method was optimized for quantification of enzyme reaction product. Peptides suitable for development of fluorescent-labeled substrates of rhomboid proteases were identified.

Keywords

affinity capillary electrophoresis, binding constants, capillary electrophoresis, chiral separations, DNA, enzyme, ethidium bromide, helquats, oligonucleotides, oligophenylenes, partial-filling, peptides