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Determination of stability constants of charged cyclodextrin comlexes by capillary electrophoresis

Abstract

Stability constant characterizes binding interaction between an analyte and complexation agent. These interactions play very important role in separation processes of, in other way undistinguishable, compounds, e.g. enantiomers. The most widely used complexation agents are cyclodextrins.

Affinity capillary electrophoresis (ACE) belongs to methods suitable for the determination of stability constants. The stability constant is determined from the dependence of the effective mobility of analyte on the increasing concentration of complexation agent in background electrolyte (BGE). If charged CDs are used, the attention must be paid not only to viscosity of the BGE and to the influence of Joule heating on the temperature in the capillary but also to the increasing ionic strength.

The thermodynamic stability constants of R,R- and S,S-hydrobenzoin and R- and S-(3-brom-2-methyl-1-propanol) with cationic modified β-cyclodextrin: 6-monodeoxy-6-mono(3-hydroxy)propylamino-β-cyclodextrin hydrochlorid (PABCD) were determined by affinity capillary electrophoresis. The average temperature (25°C) of the BGE in the capillary was kept constant. This was achieved by decreasing of the cassette temperature (based on the conductivity measurements). The viscosity correction was performed using the viscosity ratio. The increase of ionic strength due to increasing PABCD concentration in the BGE was compensated by changing of the concentration of the separation buffer.

In the next step, the dependence of the analyte effective mobilities on PABCD concentration was measured without the ionic strength compensation to demonstrate the influence of ionic strength on the stability constant. A new procedure was established to estimate stability constants from such data, too. These stability constants are in very good agreement with those obtained at the constant ionic strength.