Studies in pressurized Planar Electrochromatography

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Abstract:

This thesis describes separations performed by Pressurized Planar Electrochromatography (PPEC), which is a chromatographic method developed at IUPUI. In PPEC the mobile phase is driven by electroosmotic flow, while the system is pressurized to allow temperature control. This results in a highly efficient chromatographic system that has several attractive attributes including the ability to separate multiple samples simultaneously. The first three chapters of the thesis describe the relationship of PPEC to other forms of chromatography, the theoretical background of PPEC, the PPEC apparatus, including the plate holders used, and the different manipulations involved in preparing a plate for a PPEC run. The fourth chapter describes two short studies. The first demonstrates that a very fast separation of steroids on a high efficiency sorbent layer can be effected by PPEC. This is illustrated by the separation of six steroids in three minutes on a Superspher layer, with an efficiency of over 100,000 plates per meter. The second study attempted to improve the efficiency of separation by imposing a temperature gradient. The study was not successful, possibly due to Joule heating within the layer overriding the temperature gradient. The final chapter of the thesis describes two different studies on separating peptides by PPEC. The first study was performed on a bonded C18 sorbent layer that was treated with Brij-35, which is a non-ionic surfactant that prevents irreversible adsorption of the peptides to the sorbent surface while allowing electroosmotic flow. The variables involved in preparing the plates by soaking in a Brij-35 solution were investigated as well

as the variables for PPEC (temperature, pressure, electrical potential, and mobile phase composition and pH). It was possible to separate six peptides in eight minutes using this approach. The second study used monolithic sorbent layers prepared by Dr. Frantisek Svec of Lawrence Berkeley National Laboratory. Separations were by conventional PPEC on charged monoliths and by electrophoresis on neutral monoliths. The same variables for PPEC, listed in the above paragraph, were investigated for the monolith study. It was possible to separate six peptides in two minutes on neutral monoliths and in one minute on negatively charged monoliths.

Description:

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