

ABSTRACT (EN)

This dissertation thesis is focused on physicochemical and chromatographic characterization of polyaniline-coated stationary phases. In the first part, surfaces of bare silica and octadecyl silica sorbents were modified by *in-situ* chemical polymerization of aniline hydrochloride and their subsequent systematic characterization was performed by using the linear solvation energy relationship approach in the HILIC mode of capillary LC. In addition, several common physicochemical techniques were used to characterize properties of these altered materials. The modified sorbents were then packed into capillary columns. The retention interactions taking place between solute and the separation system were evaluated on the basis of retention data of a number of various solutes. The results showed that polyaniline coating had a significant effect on the retention promoting interactions of both polyaniline-coated stationary phases. The assumed mixed-mode retention mechanism was proven for both the stationary phases.

The second part dealt with investigation of the separation potential of polyaniline-coated silica stationary phase in different chromatographic modes. The retention factor curves of structurally similar solutes were constructed as a function of organic modifier portion in the mobile phase. The obtained results showed that the stationary phase is applicable in more than one chromatographic mode. Next, the separation performance of polyaniline-coated sorbent was assessed for two sets of either hydrophobic or hydrophilic structural analogues in the NP, RP and HILIC modes. Due to the mixed-mode retention mechanism of this stationary phase, the elution order of solutes is not governed only by their polarity. In addition, selectivity of this stationary phase was compared to the selectivity of unmodified bare silica and octadecyl silica commercial sorbents.

The last part was focused on protonation ability of polyaniline-coated silica sorbent and its effect on retention behavior of various solutes in the mobile phase of different pH investigated by the linear solvation energy relationship in RP mode. The results show that pH of the eluent has a remarkable effect on the extent of dominant retention interactions. By tuning the mobile phase pH, we can modulate the retention of neutral hydrophobic solutes due to the pH-dependent charge and structure of polymer chains of the polyaniline-coated sorbent which shows a mixed-mode separation mechanism also in RP mode.