ABSTRACT

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Title of thesis: Modification of capillary wall by graphene for separation applications

Capillary electrophoresis (CE) is a highly efficient separation method. Substances are separated due to their different mobility in an electric field. The CE modes of operation can be modified in different ways, e.g. capillary electrochromatography or micellar electrokinetic capillary chromatography. Modification of the inner wall of the capillary is believed to help improve separation efficiency and selectivity.

Graphene is carbon with a hexagonal structure in form of two-dimensional sp^2 single-atom-thick sheets. Graphene seems to be a suitable material for separation application due to its excellent properties such as large surface area and affinity to aromatic ring through π-π interactions. Our work is focused on the modification of the capillary wall by graphene. One of the methods of capillary wall modification is the Layer-by-Layer method via layering of differently charged substances bounded by electrostatic forces. Another method is chemical coating employing covalent interactions. Different combinations of polymers and graphene were used for surface modification.

Separation efficiency and selectivity of modified capillaries were studied on the model mixtures of analytes e.g. parabens, nitrophenols and others. Obtained results were compared with commercial unmodified capillary. Longer interactions of analytes with the surface and improved separation were observed.

Keywords: Capillary electrophoresis, Graphene Oxide, Layer-by-Layer modification