

## Abstract

This PhD thesis provides a commented set of four publications. These publications are focused on capillary electrophoresis, liquid chromatography, and UV/Vis spectrometry used to study complexes of rhenium with aromatic ligands. The methods of mass spectrometry with soft ionization techniques,  $^1\text{H}$  and  $^{13}\text{C}$  nuclear magnetic resonance, and infrared spectrometry were used for structural characterization of the individual complexes. The complexes were synthesized in reactions of the rhenium precursor tetrabutylammonium tetrachlorooxorhenate with the corresponding ligand under both aerobic and anaerobic conditions. In the course of the research, it was revealed that the prepared complexes (with Re in the oxidation number +V and +VI) are unstable and their oxidation numbers change to another more stable form ( $\text{Re}^{+\text{VII}}$ ).

Sub-projects which were successfully implemented during the research were as follows:

- Design and successful realization of the process of synthesis of selected rhenium complexes with aromatic ligands 1,2-dihydroxybenzene, 1,2,3-trihydroxybenzene, and 2,3-dihydroxynaphthalene in reactions with and without air access, and their structural characterization by ESI-MS, APPI-MS, LDI-MS, ESI-MS/MS, NMR, and IR.
- ESI-MS SRM and UV/Vis time studies of the behaviour of primary rhenium complexes ( $\text{Re}^{+\text{V}}$ ) with aromatic ligands in the reaction mixture, depending on the addition of triethylamine as a reaction accelerator and the conversion of the complexes to another more stable form.
- Development and successful realization of the process of separation of the individual components of the reaction using the method of capillary zone electrophoresis in background electrolytes with a changing pH-value. Monitoring of the dependency of the migration time of the reaction mixture components on the pH-value of the background electrolytes. Analytical validation of the method for determining the components of the reaction mixture containing the rhenium complex with 1,2,3-trihydroxybenzene.