Streszczenie w języku angielskim

The doctoral dissertation presents solutions for the selection of a solvent for polymerization in the synthesis of macromolecular compounds with hydrophilic and hydrophobic properties. Atom transfer radical polymerization (ATRP) techniques with a reduced amount of catalytic complex were used in the synthesis of polymers characterized by narrow molecular weight distribution, both in aqueous media and in miniemulsion.

The breakthrough achievement presented in the doctoral dissertation is the development of an environmentally-friendly and economical solution in the form of the use of coffee extracts (mixtures of Arabic and Congolese coffee) or tea extracts (black, red *Pu-erh* and green tea) in the synthesis of polymethacrylates and polyacrylates. The use of miniemulsion for the synthesis of macromolecular compounds by the ATRP technique with the regeneration of activators according to the electron transfer mechanism (ARGET ATRP) favors the reduction of purification stages of the obtained polymers, due to the lack of organic solvents in the reaction system. It was also shown that the extracts are a rich source of antioxidants that act as agents reducing the activator by electron transfer in the ARGET ATRP technique, which allows for reducing the concentration of the catalytic complex while maintaining a controlled nature of the process.

The black tea extract was confirmed to be the most effective reaction system in the synthesis of polyacrylates and polymethacrylates. In order to analyze the effect of the type of tea used to prepare the miniemulsion on the efficiency of the polymerization, the activation rate constant in the electrochemical catalytic process ($k_{EC'}$) was determined. The determined $k_{EC'}$ values confirm the significantly lower efficiency of the used low molecular weight initiator (ethyl α-bromoisobutyrate) in the dispersion system compared to the usually used ATRP macroinitiators containing more than one polymerization initiation site.

Biocompatible polymeric materials with a wide spectrum of (potential) specialized industrial applications were obtained, including in biomedicine as intelligent systems for the release of active substances.