WYDZIAŁ CHEMICZNY
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ROZPRAWA DOKTORSKA

Wspomagana enzymatycznie synteza amfifilowych polimerów gwiaździstych

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ABSTRACT OF DOCTORAL DISSERTATION

Enzymatically assisted synthesis of amphiphilic star-shaped polymers

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In this study, new amphiphilic star-shaped polymers with a well-defined architecture were designed, synthesized and characterized, using bromoacyloxy cyclodextrin derivatives as initiators. The arms were synthesized using oligoethylene glycol monomethyl ether methacrylate (OEOMA300 and OEOMA500), [2-(methacryloyloxy)ethyl]trimethylammonium chloride (META) and *N*-(3-sulfopropyl)-*N*-(methacryloxyethyl)-*N*,*N*-dimethylammonium betaine (DMAPS), under conditions of enzyme-assisted atom transfer radical polymerization (ATRP). The preparation of star-shaped polymers by this method was a novelty in the literature and filled a gap in the existing body of knowledge in this field. In the next stage, the obtained POEOMA300 and POEOMA500 polymers were used as macroinitiators in a ring-opening polymerization (ROP) process carried out with D,L-lactide or ε-caprolactone, yielding mikto-arm star structures with varied compositions and properties. Selected polymer samples were subjected to hydrolytic degradation at room temperature in PBS solution at pH 7.4 or 5.0 to assess the materials' susceptibility to degradation in an aqueous environment.

The characterization of the obtained initiators and polymers was carried out using a range of complementary analytical methods, which confirmed their structure and enabled the assessment of their physicochemical, thermal and surface morphology properties. Given the significant problem of persistent organic pollutants in natural waters, particular emphasis was placed on the potential use of the obtained polymeric materials as agents for the removal of bisphenol A (BPA) from aqueous solutions. Additionally, the possibility of producing homogeneous thin-film coatings using selected polymers was investigated, analyzing the influence of spin-coating process parameters on surface morphology and the homogeneity and thickness of the resulting coatings.