SUMMARY

The theoretical part of this thesis provides the definition, division and methods of preparation as well as extensively discusses the use of ionic liquids with particular reference to the ones which are derived from natural materials, including amino acid ionic liquids.

In the experimental section, the preparation, identification, physicochemical properties and biological activity of 54 amino acid ionic liquid have been described, 34 of which were new compounds.

For the preparation of organic hydroxides and chlorides with cations such as tetrabutylammonium, tributylmethylammonium, 1-ethyl-3-methylimidazolium, cholinium, didecyldimethylammonium, benzalkonium and amino acids such as glycine, L-valine, L-leucine, L-isoleucine, L-methionine, L-threonine, L-histidine, L-tryptophan, L-tyrosine and L-cysteine were used. For the modification of amino group in amino acid, ionic liquid-supported Schiff bases-derivatives of benzaldehyde and 2-hydroxybenzaldehyde were used. Methodologies for study of cellulose dissolution, isomerization reaction and Knoevenagel condensation were also described. Furthermore, hemocyanin complexes from *Rapana thomasiana* with a series of biocompatible amino acid salts were obtained.

The prepared compounds have been generally identified by ^{1}H NMR and ^{13}C NMR and, for selected salts, also by ESI-MS spectra.

For amino acid ionic liquid-supported Schiff bases, in which proton transfer equilibrium exists, the measurements of deuterium isotope effects on chemical shift were investigated. This method allows to detect the presence of proton transfer equilibria and determine respective mole fractions of tautomers. Moreover, the influence of temperature, solvents and anion structure on the position of proton in intramolecular hydrogen bonds were determined.

The physicochemical properties of obtained compounds such as viscosity, thermal stability (TG) and phase transformations (DSC), surface activity, solubility in water and typical organic solvents have been determined. The viscosities of analysed ionic liquids remained within the range of 0,733 - for low viscosity amino acid ionic liquids - to 653,314 Pa·s - for amino acid ionic liquid-supported Schiff bases - both measured at 25°C.

Selected ionic liquids were used in dissolution of cellulose process. Only ionic liquids with 1-ethyl-3-methylimidazolium cation displayed the ability to dissolve this polymer.

Ossowicz Paula

Salts with didecyldimethylammonium and benzalkonium cations have shown active surface activity comparable with other cationic compounds and foaming properties.

The obtained amino acid ionic liquids have been used in the Knoevenagel condensation. The test compounds significantly increased yield of the model reaction (up to 99%) and have been used in the subsequent reaction cycles (up to 9 cycles) without any significant reduction of yield.

The studies of biological properties of amino acid ionic liquids include determination of their antimicrobial activity against selected strains of bacteria and antiproliferative activity against normal and cancer cells. All tested amino acid ionic liquids induce significant rearrangement of the secondary structure of the hemocyanin from *Rapana thomasiana*. The cytotoxic effect of hemocyanin complexes with a series of amino acid ionic liquids on breast cancer cells (MCF-7) and 3T3 fibroblast cells (non-cancerous) was evaluated. Complexes exhibited enhanced antiproliferative activity toward the MCF-7 cell line. The observed antiproliferative effect was cell-specific and compounds have no effect or in some cases

Ossowicz Paula