Summary of doctoral thesis

In recent years, awareness of many existing environmental problems has increased, such as, for example, water and air pollution, excessive use of resources, global warming, ozone depletion, and the accumulation of hazardous waste. Promoting and adhering to sustainable production and consumption practices is one of the critical challenges of modern society and concerns all sectors of industry and products. Disposable baby diapers are essential in terms of production volume and consumer function. At first glance, they seem cheaper than the reusable (cloth) diapers used several decades ago, which should be washed and ironed. For several years, biodegradable, much more environmentally friendly products have been gaining popularity.

The doctoral thesis aimed to develop and implement the production of biodegradable polymer systems with absorbent and liquid-distributing properties, which will meet the requirements of producers and consumers. A biodegradable absorbent pad has been designed to be compatible with the reusable compostable cover. Hygiene products consist of several layers of different plastics stacked on top of each other. Still, the biggest problem in disposal and recycling is a synthetic superabsorbent mixed with cellulose pulp. Therefore, the main goal was to obtain a biodegradable superabsorbent polymer with absorption properties similar to those based on poly(sodium acrylate).

As a result of grafting polymerization with six different pathways, the following products were synthesized: (SS-g-PAA(12/CAN); SS(12)-g-PAA(CAN); SS-g-PAA(CAN); SS-g-PAA(KPS); CS-g-PAA(CAN/U/NaOH); CS-g-PAA(KPS/U/NaOH) successfully cross-linked, which was confirmed by FTIR, SEM, TA methods. Subsequent studies were able to obtain SS-g-P(AA-co-HEMA) by grafting polymerization and PVA/PS-g-P(AA-co-AM) and PVA/PS-g-P(AA-co-AM-co-AMPS) for mediated by reaction with the interpenetration of polymer chains (IPN). As a result of grafting polymerization with six different pathways, the following products were synthesized: (SS-g-PAA(12/CAN); SS(12)-g-PAA(CAN); SS-g-PAA (CAN); SS-g-PAA(KPS); CS-g-PAA(CAN/U/NaOH); CS-g-PAA(KPS/U/NaOH) successfully cross-linked, which was confirmed by FTIR, SEM, TA methods. Subsequent studies were able to obtain SS-g-P(AA-co-HEMA) by grafting polymerization and PVA/PS-g-P(AA-co-AM) and PVA/PS-g-P(AA-co-AM-co-AMPS) for mediated by reaction with the interpenetration of polymer chains (IPN). In recent experiments, obtained physical cross-linking products in the form of CMS(1)/Ch(1)/Van(1), where vanillin (Van) was used as a cross-linking agent and monomers were applied as carboxymethyl starch (CMS) and chitosan (Ch). In order to confirm the absorption properties, swelling tests were carried out in deionized

water at room temperature and 38°C (simulated human body temperature), in various concentrations of sodium chloride, in various buffer solutions. Also, they checked the dehydration possibilities of the resulting superabsorbent polymers. Biodegradation, composting, ozone aging, and also performed ecotoxicity tests.