

NEW BIODEGRADABLE PLASTICIZER FOR PHB JAUNS BIOLOĢISKI SADALĀMS PHB PLASTIFIKATORS

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Summary. The main objective of our research was development of plasticized biodegradable films on the base of microbiologically produced biopolymer polyhydroxybutyrate (PHB). The presented experimental results testify possibility to use new kind of ecologically-sound commercial Danisco produced plasticizer Grinsted Soft-N-Safe (GSS) for plasticization of PHB. Influence of GSS on the changes of mechanical, thermal characteristics and biodegradation rate of PHB films was verified and efficiency of GSS was found to be comparable with traditional PHB plasticizers.

Biodegradable plastics from renewable biopolymers have been considered as new generation of materials significantly reducing the environmental impact and offering original solutions in different application sectors.

The main objectives of present study was focused on the development of modified systems of microbiologically synthesized biodegradable polyhydroxybutyrate (PHB) by use of new rank of commercial Danish-based Danisco produced biodegradable plasticizer under brand name Grinsted Soft-N-Safe (GSS) designed and found to be efficient for polyvinylchloride (PVC) packaging.

Two grades of PHB with different molecular weight were employed as matrix for plasticized system formation: PHB – synthesized at LU MBI (~ 2 000 kDa) and BPHB – product from Brazil Industrial S/A (~ 200 kDa).

Plasticizer GSS is an acetic acid ester of monoglycerides made from fully hydrogenated castor oil with degree of acetylation approx 0.9 and molecular weight 500.5 g/mole, approved in EU for use in food contact material [1].

Plasticized PHB films were prepared by conventional solution casting technique from 1...2 % chloroform solution and effect of GSS content (15...30 wt% from PHB) on the changes of mechanical properties of PHB was evaluated and compared with influence of some traditional plasticizers – polyethylene glycol 300 (PEG), laprol 500 and dioctylsebacate.

In terms of mechanical characteristics influence of GSS on the changes of tensile strength (σ) were found to comparable with corresponding values of traditional plasticizers. Influence of GSS on the increase of elasticity (ϵ) was less pronounced but obtained results are quite sufficient for specific fields of application (food packaging, coatings etc.).

DSC results testify that GSS form a compatible single-phase system with PHB and incorporation of GSS assured some depression of melting (T_m) and glass transition (T_g) temperatures of both PHB used. Tendency to biodegradation carried out as described [2] of both plasticized PHB was similar and the weight loss ~ 60...70 % from initial mass was achieved during ~ one month exposure in soil. Consequently, the obtained results demonstrate that new plasticizer GSS could be considered as true and ecologically sound plasticizer for PHB systems and safe alternative to conventional phthalates.

References

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