THERMOPLASTIC CELLULOSE ACETATE COMPOSITES WITH INORGANIC FILLERS

Rokas Jakubauskas[1], Ramunė Rutkaitė[1], Dovilė Liudvinavičiūtė[1], Laura Pečiulytė[1], Joana Bendoraitienė[1], Kęstutis Baltakys[2], Andrius Gineika[2]

[1]Department of Polymer Chemistry and Technology, Kaunas University of Technology, Lithuania
[2]Department of Silicate Technology, Kaunas University of Technology, Lithuania
rokas.jakubauskas@ktu.edu

With the increasingly growing production of synthetic polymers, waste management is becoming a global issue. This leads to massive waste disposal in landfills, where eventually discarded polymers end up in the natural ecosystem, disrupting the normal habitat of living organisms, and plastic waste incineration increasing greenhouse gas emissions. Biodegradable cellulose acetate (CA), a modified natural polymer, is an excellent alternative to synthetic plastics, given that it could reach similar mechanical properties to its counterparts. CA cannot withstand heat treatment without decomposition. However, by using plasticizers, thermally processable CA mixtures can be formed. Moreover, inorganic minerals can be used as fillers in polymer composites to increase the melt fluidity and enhance mechanical, thermal and/or dielectric properties of the products.

In this study, the thermoplastic CA composites were formed from CA, various plasticizers, namely, polyethylene glycol, triacetin, triethyl citrate, and two types of inorganic filler particles: waste silica gel particles from aluminum fluoride production and opoka rock particles, which were hydrothermally treated and calcinated beforehand. By varying the amounts of CA, plasticizers and filler particles, a set of thermoplastic mixtures was prepared and thermally processed using twin-screw extrusion, by assessing the extrusion parameters. Additionally, the samples were formed by injection molding, and their thermal, mechanical and hydrophobicity properties were evaluated for the purpose of appraising these bioplastic composites in potential applications.

Acknowledgement. This project has received funding from the Research Council of Lithuania (LMTLT), agreement No S-ST-23-52.