TAL TECH

TALLINN UNIVERSITY OF TECHNOLOGY
SCHOOL OF ENGINEERING
Department of Materials and Environmental Technology

INVESTIGATION OF LIQUID RESISTANCE AND UV AGEING OF REED-BASED POLYMER COMPOSITES

PILLIROOST VALMISTATUD POLÜMEERIKOMPOSIITIDE VASTUPIDAVUSE UURIMINE VEDELIKES JA UV-VANANEMISELE
MASTER THESIS

Student:	Margarita Timofeeva
Student code:	194258 KVEM
Supervisors:	Dr. Heikko Kallakas, Researcher
	Percy Festus Alao, Early Stage Researcher

Tallinn 2021

Author Margarita Timofeeva

Title of thesis Investigation of liquid resistance and UV ageing of reed-based polymer composites

SUMMARY

This master thesis investigated composite materials incorporated with reed powder as the filler. Three variants of reed powder were used: untreated and pigmented (black and blue). The reed performance was examined using a synthetic polymer (poplypropylene) and a biobased polymer (polylactide). The performance of the composites vis-à-vis the reed treatment and polymer matrix was then characterized in terms of resistance to liquid absorption and swelling, as well as ageing with ultraviolet radiation for a period of 3 months.

Regarding the liquid resistance test, the results indicated that treating the reed with the color pigments decreased the composite water absorption and swelling. Furthermore, the composite materials with reed became more matte than pure polypropylene material as reed strongly influences gloss of material. Overall, polypropylene composites produced superior outcome to the PLA composites, though the neat polymer properties also indicated that PP was more stable to UV and liquid degradation. The photodegradation of the surface of the samples under the influence of ultraviolet radiation leads to a decrease in the gloss of the surface, as well as fading of the colored samples. This also leads to the increase of swelling in thickness.

Based on the data obtained, we can conclude that the resulting material showed adequate results in durability parameters, and any type of developed composites can be successfully used.