

Study of microplastics formation from wood plastic composites and evaluation of prevention possibilities (MicroWPC)

Project funder – **Latvian Council of Science**

Project name – **LZP FLPP 2022/1**

Project No. **lzp-2022/1-0639**



Project's progress report for the period **03.07.2023. – 29.12.2023.**

During the reporting period, work continued on the implementation of work packages WP1 and WP2, and the first experiments were initiated for WP3. The overall progress of the project aligns with the developed timeline. Within WP1 (Develop a process design for the evaluation of MPs formation from WPCs), a process design has been created to capture microplastics (MPs) of various sizes ($> 4000 \mu\text{m}$, $4000\text{-}500 \mu\text{m}$, $500\text{-}150 \mu\text{m}$, $150\text{-}75 \mu\text{m}$, and $75\text{-}20 \mu\text{m}$) formed during the weathering process of wood plastic composites (WPC). Additionally, the process design has been developed to collect wastewater that may contain heavy metals and MPs with a size $< 20 \mu\text{m}$. Throughout the first year, the process design has been continuously improved to minimize the occurrence of other pollutants that could affect the results. Following this stage, research was conducted with the first series of WPCs. The results obtained indicated that a significant amount of MPs is formed during the weathering process, with a size below $500 \mu\text{m}$. Reproducibility studies of the process design were also conducted with WPCs of identical composition, showing that the collected amount of MPs (mass per the exposed surface, g/m^2) is similar. This suggests that the developed process design can ensure very good reproducibility. With the obtained results, we participated in the international conference (WSE 2023) with an oral presentation. The preparation of a publication has also been initiated. Work on WP2 (Determine the effect of WPC composition on MPs formation and characteristics) continues with the manufacturing of WPCs with appropriate composition, obtaining sheet-like samples. Work on the base composition (40% pine wood particles with a size of $1000 - 400 \mu\text{m}$ and 60% recycled polypropylene) that was used for the compliance and reproducibility investigations of the developed process design in WP1 has been completed. Experimental work on assessing changes in recycled plastic under UV radiation has been completed by analysing these samples with various methods. Interpretation of these data is ongoing. With the obtained results, we participated in an international conference (BPS 2023) with a poster presentation, and a publication is currently being written. Work has commenced on the characterization and analysis of "real" MPs obtained and "captured" in the sieves of the WP1 developed process design experiments. In WP3 (Characterise the surface properties of WPC during weathering), research on WPC with a base composition has been initiated, analysing mass loss and characterizing surface changes during the weathering process using various methods (photo fixation, optical microscopy, SEM, contact angle measurements, ATR-FTIR, and colour measurements). Further research on other WPCs is planned, along with processing the obtained results for presentation at an international conference. Three students are involved in the project execution. The students and researchers actively attend webinars (The Microplastic Microbiome, Microplastics in water and sediments – Current status and future regulations, and Life in plastic, it's not fantastic? Effects of microplastics pollution throughout amphibian metamorphosis) and training schools (CUSP workshop and PRIORITY workshop) on the topic of MPs. PhD Edgars Kuka has been confirmed as the Latvian representative in the COST Action CA20101 PRIORITY (Plastics Monitoring Detection Remediation Recovery) management committee.

Publicity:

- BSc. Lotārs Oliveris Vasiļjevs participated in the international conference **Baltic Polymer Symposium 2023 (BPS 2023)** (Jelgava, Latvia, September 20-22, 2023) with a poster presentation titled "Changes in recycled plastics and potential of microplastic formation due to UV irradiation" (Figure 1.a). The poster displayed the results regarding the changes in recycled plastics under the influence of UV radiation, demonstrating significant differences in both photodegradation and the extent of MPs formation for recycled plastics of various origins.
- PhD Edgars Kuka, Roze Zabarovska, and Eva Guļevska engagingly informed visitors of "**Researchers' Night 2023**" on September 29, 2023 about the results obtained in the project. (Figure 1.b).



Figure 1. Publicity of the project results a) a poster at the international conference Baltic Polymer Symposium 2023 and b) participating in the event "Researchers' Night 2023."

- PhD Edgars Kuka participated in the international conference, **19th Annual Meeting of the Northern European Network for Wood Science and Engineering (WSE 2023)** (Ås/Oslo, Norway, October 10-12, 2023), with an oral presentation titled "Wood plastic composites as a potential source of microplastics" (Figure 2.a). The presentation reflected the results obtained in the project, demonstrating that WPCs without appropriate additives can generate MPs with a size $< 500 \mu\text{m}$. Additionally, the results showed that the type of wood filler used can also influence the size of the MPs. The newly developed process design scheme was also presented (Figure 2.b), along with initial results on the assessment of MPs pollution in the weathering process of materials containing plastics.

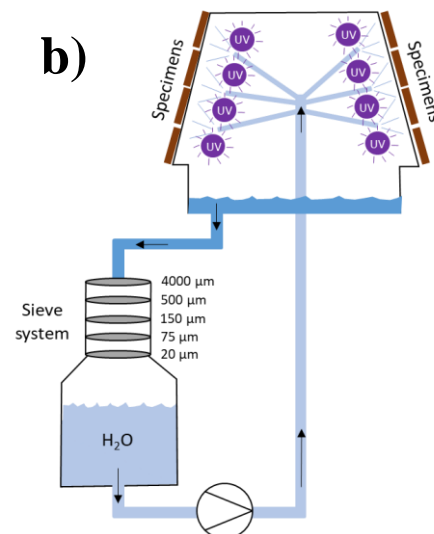


Figure 2. Publicity of the project results at the international conference WSE 2023 a) presenting an oral report and b) the scheme of the newly developed process design.

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