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UTILIZING MANUFACTURING WASTE BY DEVELOPING NEW BIO-BASED BUILDING MATERIALS

Pauls PĀVILS ĀRGALIS^{1*}, Maris SINKA², Martins ANDZS³,
Aleksandrs KORJAKINS⁴, Diana BAJARE⁵

¹⁻⁵ Institute of Materials and Structures, Faculty of Civil Engineering, Riga Technical University, Kļipsalas iela 6A, LV-1048, Riga, Latvia

* **Corresponding author.** E-mail address: pargalis123@gmail.com

Abstract – In the last decade, more research has been concentrated on reducing the usage of natural resources and waste management in construction building materials. There are many possibilities for reducing the waste from this sector, ranging from waste being used as filler materials to developing new binders and building materials. This research concentrates on bio-based building material development from wood-wool cement board manufacturing waste. The authors have found that a new bio-based building material can be produced using manufacturing waste. Two fractions of waste were used in this study. One fraction was the wood wool fibers mixed with cement that have fallen off the manufacturing chain and thus cannot be used to make wood-wool cement boards. This fraction was used as the filler material. The second fraction was the dust fraction in the quality assessment phase, where the wood-wool cement boards are sanded for better surface quality. This fraction is then vacuumed out of the manufacturing plant to avoid air pollution from the dust particles. The dust fraction contains wood wool fibers and hydrated and unhydrated cement particles. The cement particles are conglomerated when the mixing process of water, cement and wood fibers occurs. The hydrated cement particles stick around the unhydrated cement particles, encapsulating them. This results in not all the cement used to manufacture wood-wool cement boards. These conglomerates, however, can be broken down with a milling process and can hydrate once the water has been added. The binder with the filler material was used to develop bio-based building materials. The developed materials were tested for their apparent density, compressive strength, and thermal conductivity coefficient. The obtained results showed promising data for self-bearing bio-based building materials to be similar to other bio-based materials for their thermal properties and use as thermal insulation materials. The apparent density of the developed bio-based composites was 384–555 kg/m³. The conclusion was made that by using waste materials for the production of bio-based building materials, it is possible to reduce the overall waste of the manufacturing plant and increase the sustainability aspect of wood-cement board manufacturers.

Keywords – Concrete composite; rubber crumbs; substitutes sand filler; utilize discarded rubber