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UPCYCLING ORGANIC WASTE STREAMS INTO BIO-COMPOSITE MATERIAL FOR NATURE RESTORATION

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In order to close the loop in a circular economy, the use of biobased and/or wastebased resources is required. This makes both biobased resources and waste streams important input streams for material development in a circular economy. We developed a biobased and wastebased composite material called Re-plex. Its main ingredients are Kaumera and cellulose fibers which are both organic resources retrieved from wastewater treatment plants. Kaumera is a water soluble biopolymer, produced by bacteria in the Nereda® wastewater treatment process. The cellulose fibers are retrieved from toilet paper sieved from the wastewater treatment plant.

To produce Re-plex, the Kaumera and fibers are mixed into a dough like substance. This dough is pressed in a mold under a hot press to obtain a rigid composite material. Due to crosslinking of Kaumera during the curing process, the material becomes water-resistant. Other interesting material properties of Kaumera are its biodegradability and good stiffness.

We present Re-plex through a case study that fosters the unique properties of the material, i.e. biodegradability and water-resistance. In this case study we collaborate with Bureau Waardenburg, which is an ecological consultancy that works on the restoration of ecosystems. A complex structure is designed with Re-plex to support nature restoration in aquatic settings in the Netherlands. Current solutions support young plants for initial growth very well, but once the plants are strong enough to be self-supporting, the available material does not degrade fast enough in cold water. Therefore Re-plex is considered a promising alternative material as it degrades into biocompatible elements. The material will be fine-tuned for this specific application and the design will be tested on relevant aspects, like speed of degradation in Dutch waters. Hence, this case study shows the potential of a biobased material in which two major organic waste streams are upcycled into valuable products that support nature restoration.

Keywords: biobased material, wastebased material, circular economy, nature restoration