NewWave

Newsletter

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# Sustainable biobased products for the construction industry

The objective of NewWave is to transform existing fossil-based manufacturing lines into new bio-based ones. The new products must exhibit similar, or better, mechanical, physical, and chemical properties compared to the existing products, and must be non-toxic and recyclable. The Manufacturing Lines developed in the NewWave project will ensure these qualities.

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## 1. UPDATES FROM THE MANUFACTURING LINES (ML)

**ML#1:** Bio-polyol samples were prepared from pyrolysis oil and pyrolytic sugars by BTG with a focus on larger quantities and further purification. All samples were sent to AEP for further analytical testing, characterization, and validation.

AEP has explored the versatility of the bio-polyol fractions by testing them as raw materials for the synthesis of polyester and polyether polyols but also employing them as reactive hydroxyl compounds in conventional 2K PU formulations.

Polyester polyols were tested as components for hybrid epoxy-polyurethane adhesive systems, while polyethers were used to formulate 2K PU adhesives. Selected polyether-based adhesive formulations have been sent to INNORENEW where their performance as wood adhesives has been assessed.

Furthermore, BTG started with experiments to further increase the yield of small polyols MEG and MPG in the hydrogenation of pyrolysis oil and pyrolytic sugars.

Hybrid epoxy-polyurethane adhesive

**ML#2**: Pyrolytic sugar samples that were sent to the University of Groningen were analysed and tested as the feed in the production of HMF. A selection was made of the 3 best performing pyrolytic sugars feeds in terms of obtained HMF yields.

Large quantities of these selected pyrolytic sugars (5 kg each) were subsequently produced by BTG for upscaling activities by the University of Groningen and AVA BIOCHEM. TFC's in-house developed hydrogenation process has been tested extensively for ring saturation of 2- methylfuran (2-MeF) and furfuryl alcohol (FA) to produce 2-methyltetrahydrofuran (2-MeTHF) and tetrahydrofurfuryl alcohol (THFA) respectively.

The excellent reaction selectivity and catalyst recyclability of this process highlight its suitability to convert these furan derivatives. A new hydrogenation plant for 2-MeTHF and THFA production, with a capacity of 2500MT/yr, is currently in construction at TFC.

**ML#3:** Large quantities of liquid and solid lignin's were shipped to FORESA Tech to be analysed and tested in resins as a replacement for fossil phenol. Plywood resins development has been carried out by replacing phenol with the different lignin's in amounts of 25%, 50%, 75% and 100%.

A complete determination of the physical and chemical properties for the different plywood resins was carried out such as density, viscosity, pH, TGA, DSC, rheological properties and free phenol and formaldehyde content. Plywood and MDF boards have been crafted using the resins developed.

The various analyses, characterisation and reactivity testing showed a preference for the solid pyrolytic lignin. On the other hand, the manufacturing of MDF boards has begun using MDF resins with a substitution percentage of 25% of phenol with the four lignin's received. The manufacture of MDF resins with a higher percentage of lignin will be carried out in the coming period as well as the manufacturing and characterisation of the corresponding MDF boards.

In the meantime, BTG produced a large batch of pastillated solid pyrolytic lignin and shipped 25 kg to FORESA Tech for further pilot testing.


MDF boards manufactured and characterized by FORESA

ML#4: This line focuses on the modification of wood with FPBO to develop an entirely biobased alternative to currently used toxic and fossil-based preservation agents such as copper salts, organic biocide ingredients, and creosote.

Ten formulations based on FPBO were prepared and characterized in terms of pot life, viscosity, and curing behaviour among others. The impregnation process of radiata pine samples was performed in the bench-scale reactor. The uptake of the impregnation liquor was assessed by calculation of weight percent gain (WPG) for each specimen. Penetration depth was assessed with hyperspectral imaging.

Characterization methods included moisture uptake, dimensional stability, density, mechanical strength, UV stability, durability tests against fungi and moulds, fixation of components, and VOCs emission. The characterization campaign allowed the selection of the 3 best-performing formulations.

A new set of experimental samples is recently under preparation, and it will be evaluated regarding their performance in outdoor applications.

After extensive laboratory tests, new construction products will be manufactured at an industrial scale and used at a demonstration site.

Samples treated by INNORENEW

## 2. WASTEWATER TREATMENT

In the second year of the NewWave project, the SPOHDist wastewater, sproduced in the hydrotreatment of pyrolysis oil at elevated Temperature and $PH_2$ was subjected to a long-term continuous anaerobic test by means of hybrid UASB reactors at Avecom's facility.
Two similar reactors were operated simultaneously: one reactor was fed with SPOHDist, diluted with tap-water and the other reactor was fed with SPOHDist, diluted with the final treated wastewater.

At relatively high loading rates, both UASB reactors demonstrated stable performance and a relatively high COD conversion of more than 80% into biogas with a
methane content of 80%. The residual COD in the anaerobic effluents was further polished via an aerobic treatment by means of an SBR reactor, reaching a COD removal of 90%. The experiments demonstrated that the final effluent could be successfully used as dilution water for the highly concentrated SPOHDist wastewater.


Tests run by Avecom

## 3. THE BIOMATTERS CLUSTER

In 2023, the EU funded projects NewWave, AMBIANCE, BIO-UPTAKE, GREEN-LOOP, VITAL and Waste2BioComp have united under the common aim of making sustainable processes and products a norm in the EU.
To achieve this, they have formed the BIOMATTERS Cluster.

BIOMATTERS
Manufacturing technologies for bio-based materials

All projects receive funding under the Horizon Europe Programme and share a vision of providing a viable alternative to conventional materials by introducing novel materials and cutting-edge manufacturing techniques.

During the 32th European Biomass Conference and Exhibition, the six projects have gathered to present their solutions, challenges and next steps.

The discussion was joined by Silvia Maltagliati, officer of the European Commission at DG RTD, who presented the upcoming policy changes in terms of bioeconomy and encouraged the BIO-MATTERS partners to contribute to the upcoming public consultation on the EU Bioeconomy scheduled for 2025.


The BIOMATTERS partners at EUBCE 2024

# NewWave

## Partners

btg biomass technology group
AEP polymers
Avecom
BLUE SYNERGY
etaflorence renewable energies
FORECO
FORESA TECHNOLOGIES
TFC BIOMASS BASED CHEMICALS
rijksuniversiteit groningen
AVA BIOCHEM

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