IT'S ALL FROM SUGAR: BIOPLASTICS FOR TRUCKS AND BUSES

BRIGIT focuses on new applications of green polymers in the transport sector

The project: Exploring potential ways to convert wood waste into plastic composites

The recycling of transport vehicles, trucks, and trains poses severe challenges due to a high percentage of non-degradable parts and materials. With rising demand for lifecycle assessment of manufactured goods, the market for sustainable and biodegradable components in the transport sector is set to increase. This is the baseline of the BRIGIT project.

BRIGIT's focus is on bioplastic applications in the transport sector, such as headrests, floors, ceilings, and coatings, in combination with natural fibres. PHBs, PBS and its co-polymers from waste-derived lignocellulosic sugar feedstock liquor or wood sulfite pulping processes are the starting point. From the resulting new biopolymers the project intends to develop high-tech fire-resistant bioplastic applications. The biocomposites in combination with natural fabrics will be used to produce new 3D sandwich panels as an end product in the transport sector. These new panels will be a lightweight alternative to the current panels made out of thermostat resins reinforced with glass fibres. The new panels will be easily integrated in continuous manufacturing processes and value chains.

The product: Process innovation and purification technology, fire-resistant polymers

All potential products of the BRIGIT project are in development or licencing stage:

- Process for PHA and PBS production from waste (spent sulfite liquor). The main innovation in BRIGIT is the use of an existing sugar-rich waste stream and the process integration with the existing industrial operation, the in situ fermentation process. As an example, pulp production can be used for the integrated fermentation technology using engineered yeast strains. The fermentation, including its conversions into polymers, will take place in the waste stream of pulp;
- This will permit an overall reduction in resource consumption and in greenhouse gas emissions and a dramatic reduction of operational costs due to the use of non-sterile steps. No intermediate discontinuous bioreactors will be needed. Waste transport will be avoided. Applications can lie in valorisation of the by-products from paper and pulp production, processors of agro-forestry raw materials and its biorefined polymers. Possible patent protection, licencing to industrial players, technological services;
- New processes for environmentally friendly purification of PHAs and PBS, which can upgrade current purification technology. Possible patent protection, licencing to industrial players, technological services;
- Process for the preparation and modification of high molecular weight lignosulfonates. Application: plastic transformation. Possible patent;
- Engineered yeasts converting ligno-sugars to PHA and PBS. Applications are anticipated for industrial biotechnology (white biotechnology). Possible patent protection, licencing to industrial players, technological services;
- Synthesis of intrinsically fire-resistant PHB based polymers and lingosulfonates - PHB copolymers. Application: FR master batches in polymer compounding industry. Possible licencing agreement;
- Development of fire-resistant biocomposites (PHB/PBS blends). Application: fire-resistant biocomposite such as granules. Possible patent protection, licencing to industrial players, technological services;
- Development of fire-resistant 3D sandwich panels from biocomposites. Application: fire-resistant panels for transport sector. Possible patent protection, licencing to industrial players, technological services.

The end users: White biotechnology, transport vehicle manufacturing and consumers

The chemical industry and the (goods and passengers) transport sector, technology services are among those who will work with the processes developed, including the application of chemicals such as lignosulfonates for the plastic transformation process. Fire-resistant biocomposites for the transport industry will lead to new applications for manufacturers of vehicles and their users.

The construction sector will benefit from the use of newly developed, recyclable 3-D-sandwich panels.

The inventors: Industry/SME partners, research and technology organisations

The company SNIACE was working in a national project (CENIT) developing polymers from lignin sources. AIMPLAS was interested in working with these types of polymers to improve flame retardancy of standard thermoplastic materials (mainly polyolefins) as alternative to halogen based flame retardants. But during a meeting, the company GREENSOURCES (part of SNIACE group) explained that they have a blend of sugar waste from their current process which lacked a suitable application. AIMPLAS proposed then to produce PHB and PBS for high added-value applications. The BRIGIT project was then designed to focus on the production of flame retardant panels, where these polymers could be used.

The project is composed of sixteen partners, covering the entire value chain from feedstock, biosynthesis of the polymer or polymer precursor, until the optimisation of product recovery, purification and further conversion towards the final product.

The consortium is formed by seven SMEs, three industrial companies and six research centres and universities. All have recognised expertise in their respective fields.

Development stage: Proof of principle, upscaling and pilots

Despite the fact that the project consortium covers the entire value chain, the researchers and industry partners still need to solve different issues during the project such as the integration of the project developments into the current production process of raw material producers, inhibitors removal, purification developments, and the modifications required by polymer manufacturer partners to scale up the biopolymer production.

Being in the development stage, all potential BRIGIT products need to be assessed for application in other sectors. The publication of BRIGIT objectives in this innovation catalogue will increase the industry awareness, facilitating the further exploitation of its products and technologies.

Policy impact: Lifecycle regulations and biopolymer standardisation

By offering biodegradable solutions, the added value of potential BRIGIT products is on the lifecycle costs of manufactured goods and technologies, especially in the transport sector. BRIGIT will propose new testing methodologies and contribute in particular to the necessary future standardisation of biopolymers.

Next steps: New application fields and demo project

Project dissemination as described in the project workplan (brochures, workshop organisation, papers and journals, conferences) and close cooperation among project partners is required to find potential customers outside the project. At the end of the project, the results will be exploited directly by the project partners or licenced. Results which require further industrialisation will generate a new project proposal within HORIZON 2020 (probably a demonstration project) with a reduced number of partners.

BRIGIT

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