Research Summary Sheet

Eco-conversion of two winery lignocellulosic residues into fillers for the developement of PHBV-based lignocellulosic biocomposites

Context and Challenges

Poly(hydroxy-3-butyrate-co-3-valerate)-based biocomposites are multi-phasic materials made of PHBV as matrix and lignocellulosic particles as fillers. In the NoAW project, lignocellulosic fibres were obtained by dry fractionation of vine shoots or wine pomace, which are both agricultural residues. Vine shoots correspond to the pruning wood, with approximately 2 tons·ha-1 generated per year, corresponding to an annual world production of 15 million tons. Wine pomace corresponds to the solid residue from the pressing of fresh grapes, constituting at least 20% of the grape weight and thus generating more than 10 million tons every year in the world.

Results and Applications

Biocomposites with filler content up to 30 wt% were produced by melt extrusion, i.e. a process using no solvent nor additives. The development of composite structures allows to modulate the functional properties of PHBV (e.g. increase of gas permeability), while lowering the overall cost and the environmental impact of PHBV (especially the impact on global warming) proportionally to the filler content. The addition of lignocellulosic fillers also slightly accelerates the biodegradation of the materials in soil. On the other hand, the material gets a little bit more brittle with increasing filler content, which can be a hurdle for some applications. It was demonstrated that a first step of polyphenol extraction had no significant impact on the performance of biocomposites. Thus, in a biorefinery approach, it would be worth extracting polyphenols before using these agro-residues as fillers in bioomposites, in order to exploit their full potential.

The project leading to this application has funding from European Union's Horizon 2020 research and innovation programme under grant agreement No 688338.

Breakthroughs, benefits and added value

Such biocomposites could be used for injection moulding or thermoforming applications. Applications where full biodegradability in natural conditions is needed are the most relevant, e.g. for horticultural and agricultural purposes. The food contact ability should be now checked to be able to use such materials as food packaging materials.

Further information on NoAW project: http://noaw2020.eu

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