Fraunhofer WKI

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#WeKnowWood

Humic adhesive

Humins are dark-colored, highly viscous compounds. They occur as a by-product during the production of polyethylene furanoate (PEF), a new bio-based substitute for the bulk plastic polyethylene terephthalate (PET). According to calculations, in the medium to long term several tens of thousands of tonnes of humins will be produced each year, for which – until now – no applications have existed.

Researchers at the Fraunhofer WKI are developing concepts for the material use of humins. As a result of the complex chemical structure, diverse application possibilities exist.

Humic-bonded plywood and particle board

The researchers use humins to successfully bond wood. The humins produced as a by-product are heterogeneous, polydisperse macromolecules with a furanic structure and alcohol, ketone and aldehyde groups. They contain low-molecular and high-molecular fractions. When heat is applied, they cure through thermosetting.

In their development, the scientists consider both currently and prospectively relevant tree species. Investigations into fundamental characteristics such as viscosities and crosslinking/degradation behavior as well as the manageability of the humins with regard to their solubility (purification) formed the starting point of the research project.

This was followed by screening for bonding on the smallest of scales. Thin beech-wood veneers were bonded with humin-based formulations incorporating a variety of hardeners, cross-linkers and additives, and their longitudinal tensile shear strength was determined.

Currently, plywood and particle board are being produced in the technical center and the achievable board properties are being investigated.

Economically and ecologically interesting

Should it prove possible for humin-based glues to be used to produce wood-based materials which comply with the standard requirements, a new adhesive alternative would be available in very large quantities.

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