Development of novel carbohydrate-based binders for wood composites

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Today's wood board industry relies on the use of fossil based binder systems like urea-formaldehyde or melamine-formaldehyde binders. An alternative binder system with lower carbon footprint and, due to upcoming regulations, a better emission profile, is desirable. Therefore, we develop and investigate new bio-based adhesive systems for the use in wood composites like particleboard and MDF. These adhesives should outperform current fossil-based binder in terms of their carbon footprint and emission profiles while fulfilling the requirements for adhesives in industrial particleboard production. The adhesives need to be stable at room temperature for a pre-pressing period, have a sprayable viscosity and cure fast at elevated temperatures (however below 120°C). Furthermore, a low toxicity during the work process and in the final product and mechanical properties, which pass the standard board requirements, are needed. Surplus carbohydrate feedstock from existing European biorefineries is modified/converted to create building blocks, which are used for resin synthesis with different crosslinkers. Carbohydrate conversion methods are tested to find a reliable production system for these reactive intermediates. An example of such a conversion reaction is the acid-catalyzed dehydratisation of fructose to 5-hydroxymethylfurfural (5-HMF), which is an important platform chemical that can be converted further to e.g. diformylfuran or bishydroxymethylfuran.[1]

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[1] VAN PUTTEN, R.-J. et al, 2013. Hydroxymethylfurfural, A Versatile Platform Chemical Made from Renewable Resources. *Chemical Reviews,* 113**,** 1499-1597.