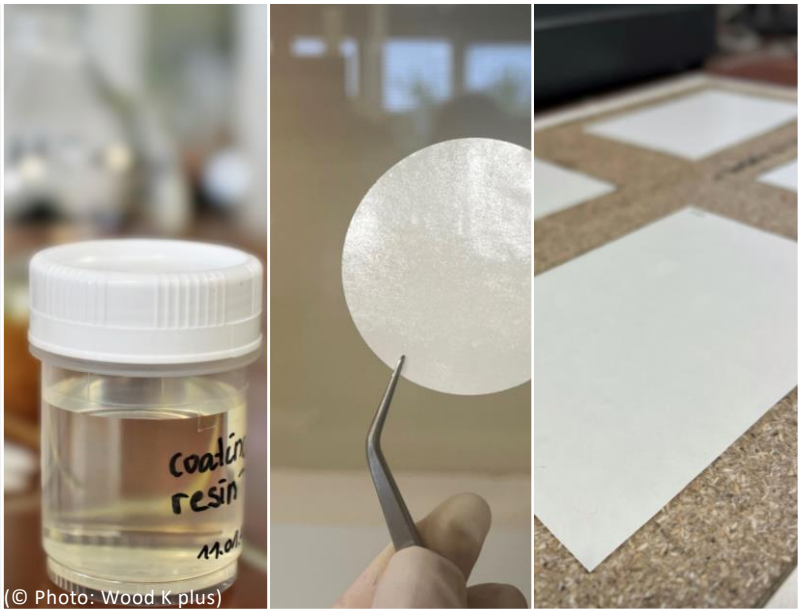
SUCCESS STORY

Wood K plus
WOOD: Transition to a sustainable bioeconomy

Programme: COMET – Competence Centers for Excellent Technologies

Programme line: COMET-Center (K1)

Type of project: Green chemicals, resins and adhesives, multi-firm



BIOBASED RESINS

SUSTAINABLE INNOVATION FOR DECORATIVE LAMINATES

Decorative laminates have become indispensable in modern interior design, with applications including furniture, flooring, and wall panels. With the growing emphasis on sustainable materials, there is an increasing demand for eco-friendly alternatives. To meet this demand, research has focused on developing new, modified melamine-formaldehyde (MF) impregnation resins. These developments represent an important step toward innovative material solutions.

Conventional MF resins have long been used in the production of decorative laminates due to their durability and design versatility. However, these resin systems are manufactured from petrochemical feedstocks, which are increasingly under scrutiny.

In the presented project, possibilities were explored to use bio-based substitutes, such as sorbitol, as resin components. The addition of this sugar alcohol results in highly cross-linked thermosets with improved surface properties and high hydrolysis resistance. This represents an important step toward more sustainable and durable coatings for wood surfaces.

The challenges included adjusting the modified resin's curing properties and optimising the processing conditions. Furthermore, a strong emphasis was placed on developing a foundation that would allow for potential upscaling while preserving existing industrial processes without adding complexity.

Advanced analytics for new insights

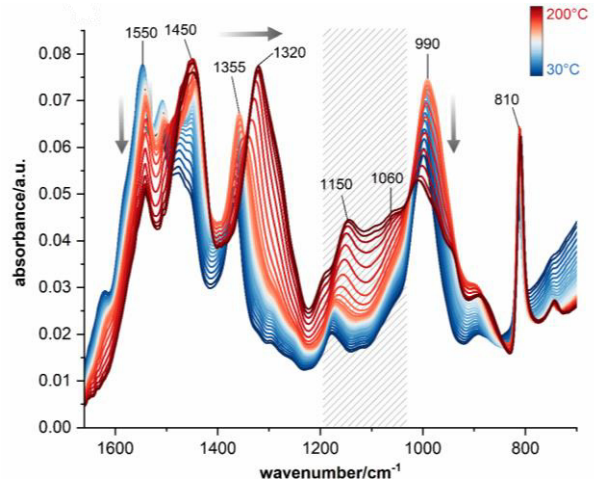
The resins were characterised using Differential Scanning Calorimetry (DSC) and Fourier-Transform Infrared Spectroscopy (FTIR). The curing behavior of the new resins was analysed throughout the entire processing chain - from the liquid resin to the fully cured surface.

Federal Ministry
Republic of Austria
Climate Action, Environment, Energy, Mobility, Innovation and Technology

Federal Ministry
Republic of Austria
Labour and Economy

Austrian Research Promotion Agency
Sensengasse 1, A-1090 Vienna
P +43 (0) 5 77 55 - 0
office@ffg.at
www.ffg.at

Hence, through kinetic and spectroscopic analyses, the optimal pressing conditions for potential industrial applications were determined.

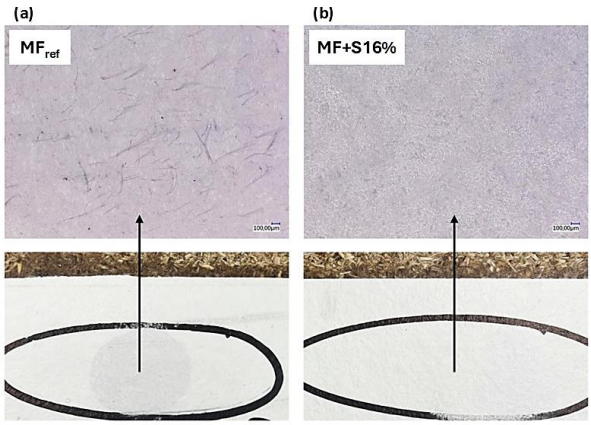


The figure shows an ATR-FTIR curing spectrum of the sorbitol resin from 30–200°C for the spectroscopic monitoring of the curing process (© Photo: Wood K plus)

Moreover, sorbitol-modified resins exhibited unique reaction mechanisms, including altered induction phases and faster curing rates at industry-relevant temperatures. Principal Component Analysis (PCA) of the FTIR data confirmed these changes in cross-linking, which contribute to the improved quality of decorative surfaces.

Impact and effects

Sorbitol-modified resins not only meet industry standards but also outperform conventional systems in standardised tests, resulting in superior surface durability. These findings open up new possibilities for tailoring resin properties to suit various decorative surfaces. This paves the way for more sustainable production practices in the laminate industry and beyond. It also provides new opportunities to enhance both the industrial performance and environmental compatibility of resins - representing a step toward innovative material solutions for the future.



The figure shows a comparison of laminate surfaces after acid treatment. **(a)** Damaged conventional MF resin laminate surface and **(b)** intact MF resin laminate surface produced with sorbitol (© Photo: Wood K plus)

Project coordination (Story)
Martina Duller, MSc.
Junior Researcher
Wood K plus, St. Veit/Glan

T +43 676 89 74 45 19
m.duller@wood-kplus.at

Wood K plus
Kompetenzzentrum Holz GmbH
Altenberger Straße 69
4040 Linz
T +43 732 2468 – 6750
zentrale@wood-kplus.at
www.wood-kplus.at

Project partner

- Fundermax GmbH, Austria
- University of Natural Resources and Life Sciences, Austria

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