

Development of depolymerized lignin acrylic coatings

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Date: 12-06-2025

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Common lignin powder [1]

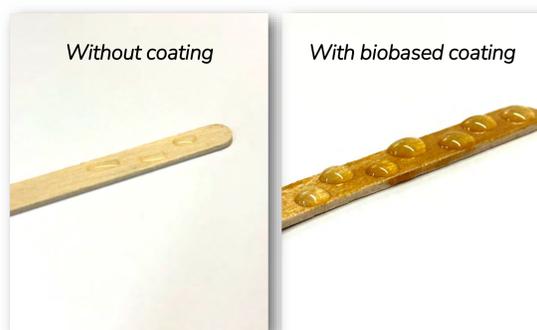
Introduction

Acrylic coatings are essential for increasing the durability of many products, however over **3.5 million tonnes** of acrylates are made from fossil fuels annually, contributing to emissions and environmental harm. [2]

To improve on its sustainability, VITO in collaboration with MNEXT aimed to create a biobased acrylics coatings using **modified lignin** as the main component in the formulation.



Commercial acrylic resin [3]

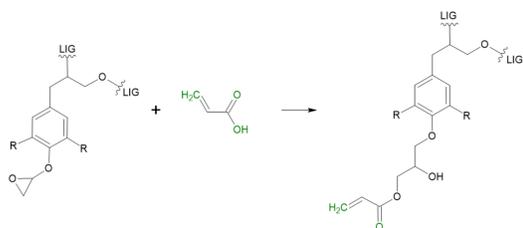


Untreated wood + drops water (left) and wood with the developed lignin acrylic coating + drops water (right)

Methodology

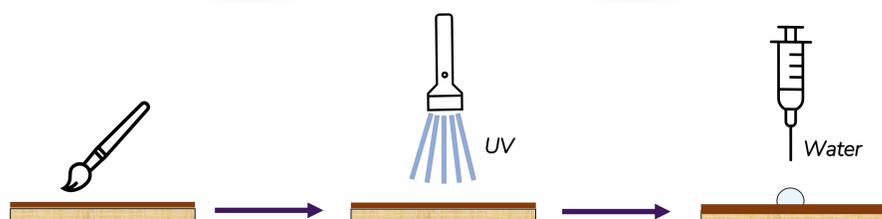
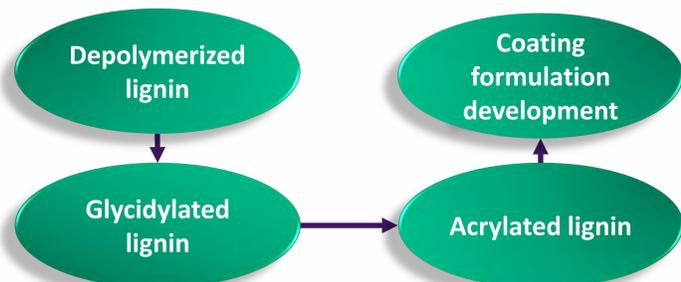
• Production of lignin acrylated resin:

Depolymerized lignin is first **glycidylated**. The glycidylated lignin was mixed with other bio-based precursors. The mixture was then **acrylated** with **acrylic acid**, creating a mix of pre-polymers that can crosslink.



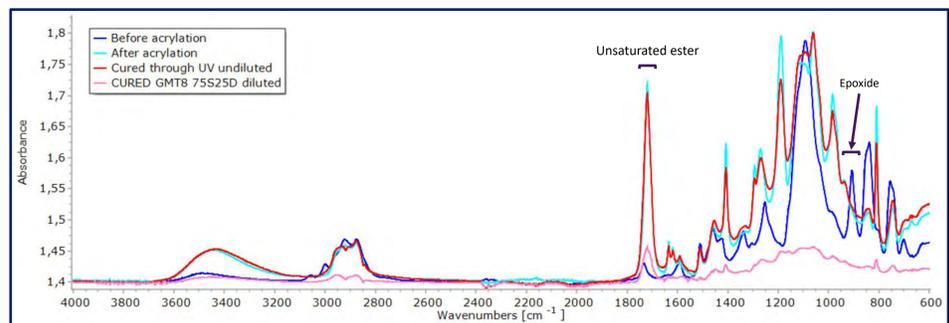
• Production of lignin acrylic coatings:

To make the coating applicable for **UV-curing** a **photo initiator** was added. To improve the **crosslinking** of the polyacrylate chains a **reactive diluent** was added during formulations which was compared to undiluted formulations.

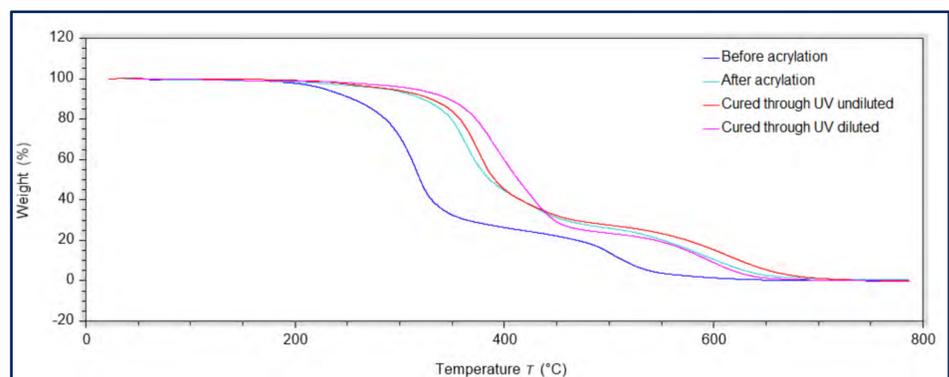


Results and Discussion

Characterization of the different stages in the development of the lignin coating was done through **Fourier Transform InfraRed (FTIR)** spectroscopy and **Thermogravimetric Analysis (TGA)**. Below is a result comparison of the different stages in the development of the coating.



FTIR results of different steps. Difference in active bonds



TGA of the different stages of the lignin blend



• Addition of reactive diluent

- Dilution of the formulation with reactive diluent increases its crosslinking ability resulting in a more thermally stable product

• Influence of photo initiator type

- The effectiveness of the initiator type was visually assessed. Noticeably, one of the initiators still held uncured fluid underneath a cured surface. This one is less effective than the other that cured fully.

Conclusion

Through acrylation a biobased acrylic resin was successfully developed which was cured with UV-light on wood.

References

[1] The LignoForce System™: A process for the production of high-quality lignin from black liquor (2016)
 [2] J. G. H. Hermens et al, "A coating from nature,". (2020)
 [3] Made-In-China, Pure Epoxy Acrylate Oligomer 100% EA, Pure Epoxy Acrylate Oligomer 100% Ea - Epoxy Resin and Epoxy Acrylate. (2025)