Bio-based vanillin polymers

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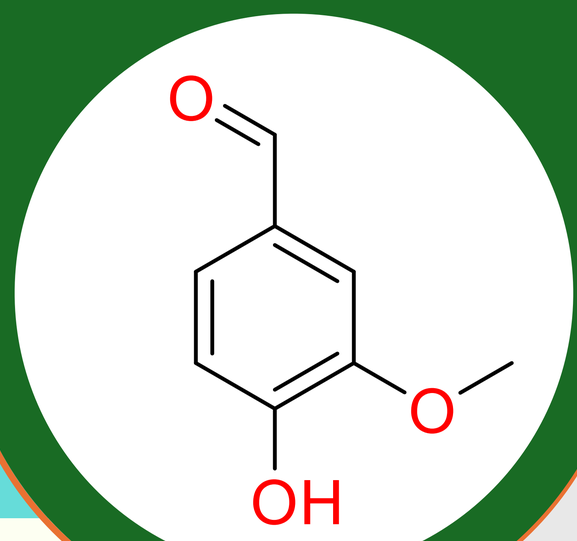
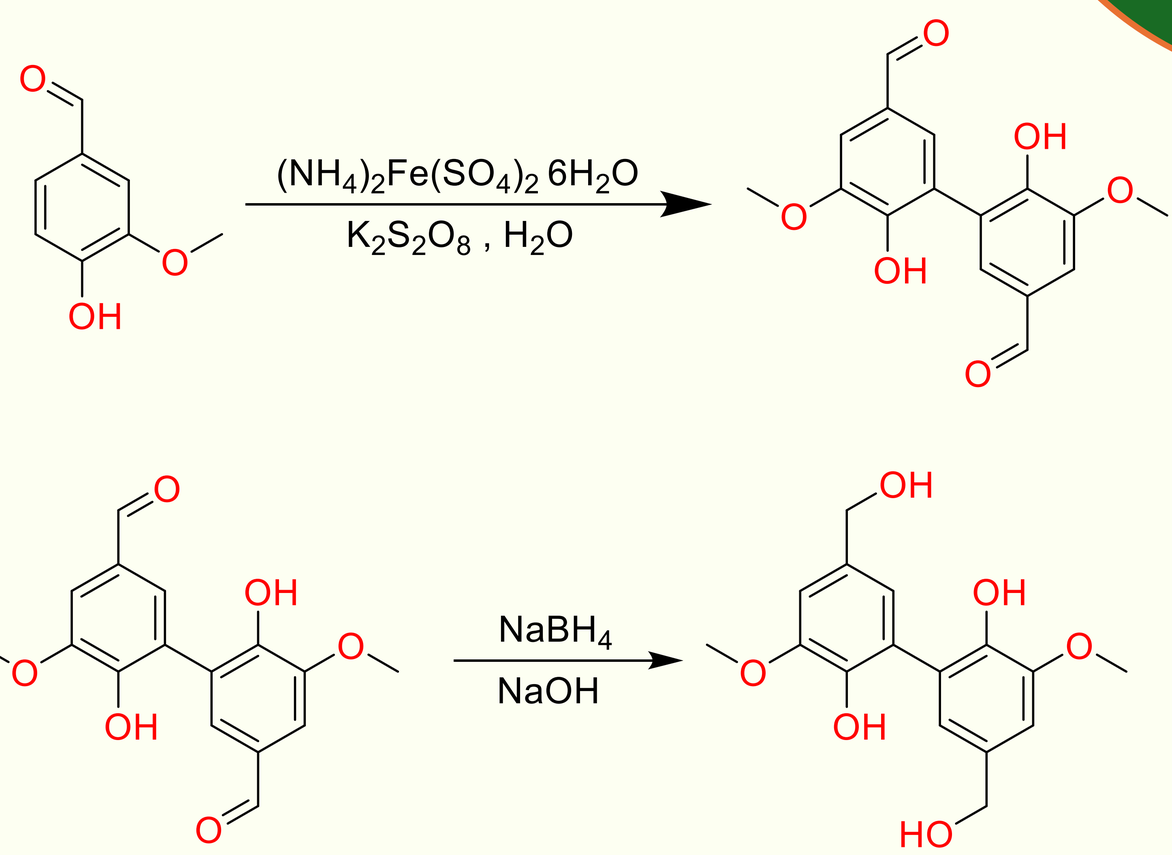


Bio-based vanillin from lignin might be relevant future building block for innovative green polymer concepts. Production of vanillin from kraft lignin is likely economically viable [1] and potentially scalable.
Here we explore polyether concepts based on Dehydrovanillin.
Dehydrovanillin was reduced from which polycondensation was performed. This is of particular interest as the self-condensed polymeric product exhibits lignin-like motives.

[1] Khwanjaisakun, N., Amornraksa, S., Simasatitkul, L., Charoensuppanimit, P., & Assabumrungrat, S. (2020). Techno-economic analysis of vanillin production from Kraft lignin: Feasibility study of lignin valorization. *Bioresource Technology, 299, 122559.*

Project: Dehydrovanillin



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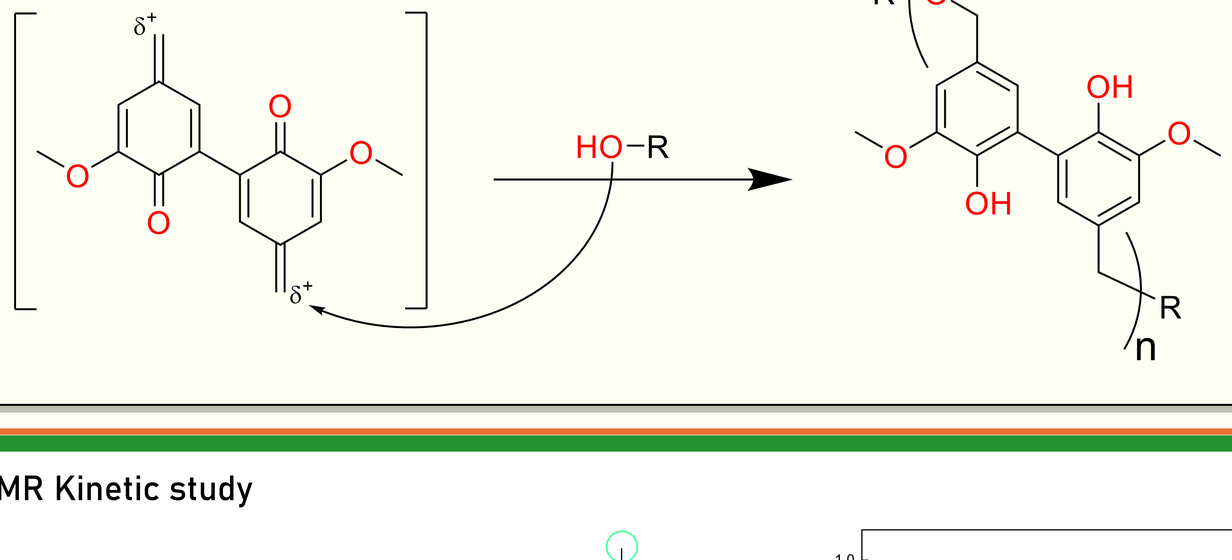
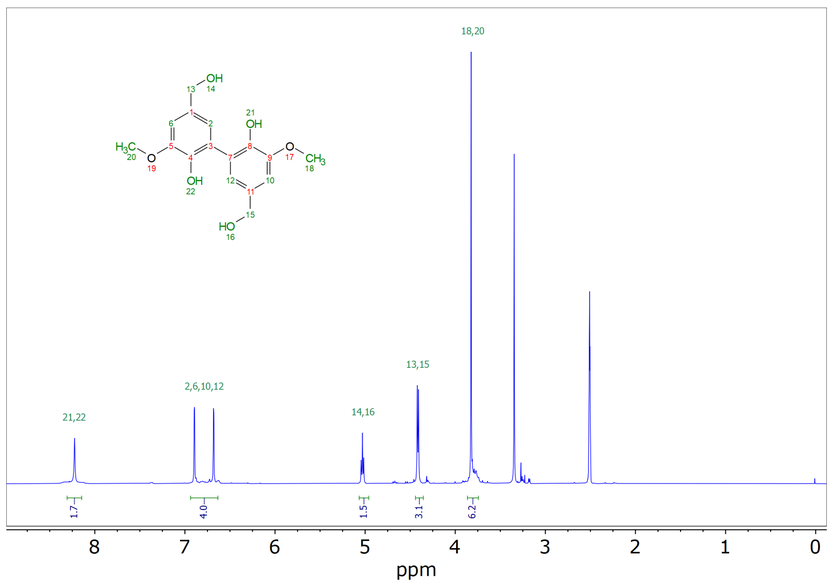
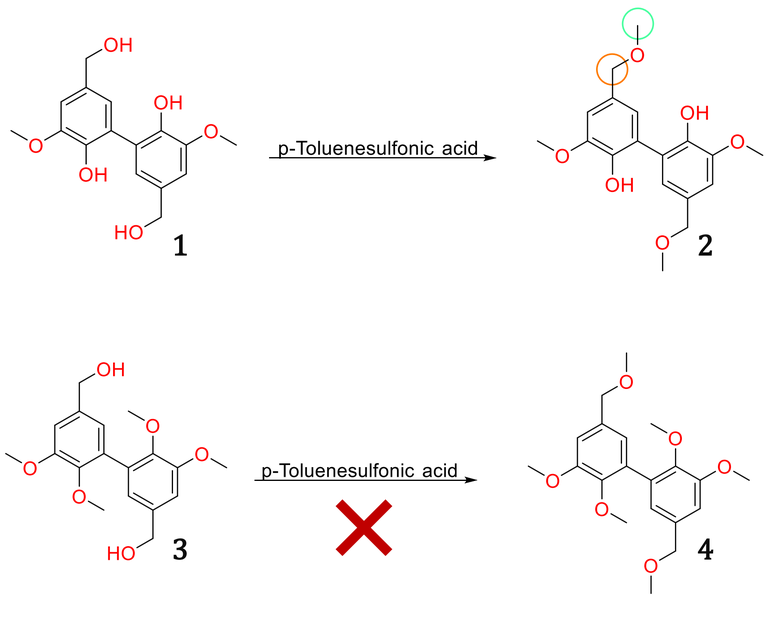
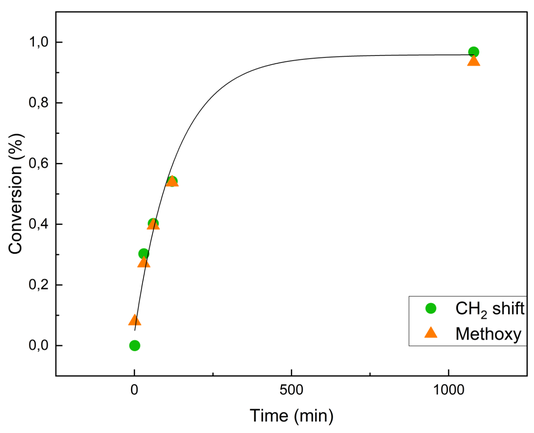
Hypothesis for polycondensation



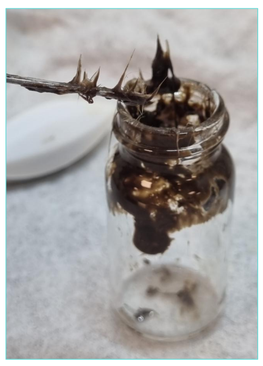


NMR Kinetic study



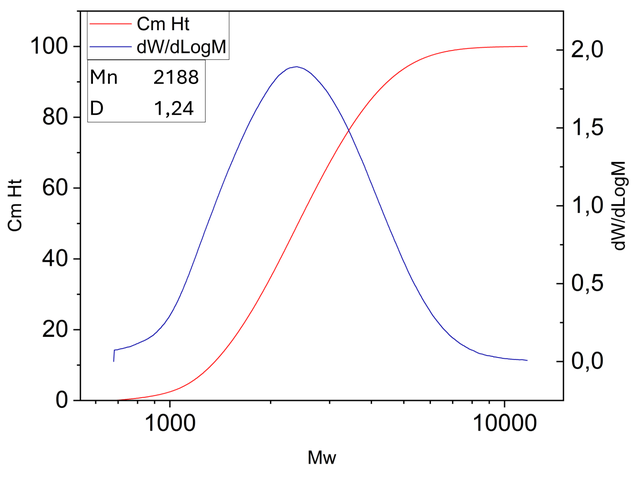


MeOH addition under acidic conditions:
- pseudo first order kinetics from 1 to 2
- Product 4 not observed



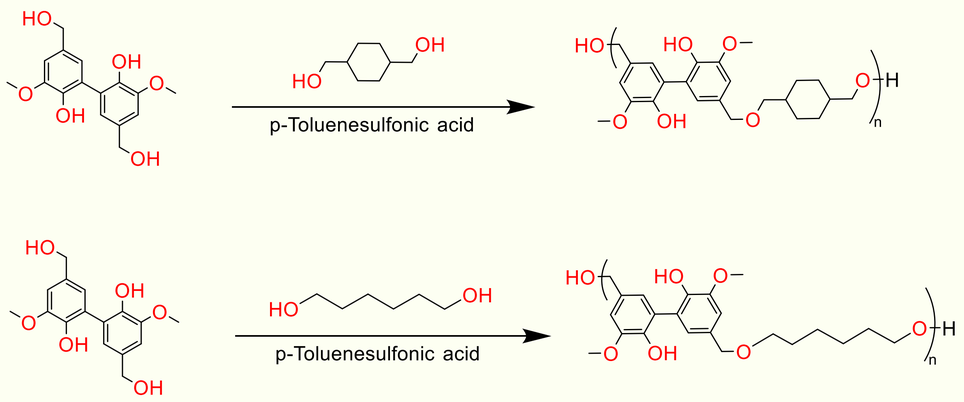
Solvent-free polycondensation at 120°C
Self-condensation of the monomer

Polycondensation at the C_α-site through a hypothesized 'para-resonance' intermediate, resulting in the formation of a polyether



Prospects

Investigation into various polymer concepts
- Thermosets
- Thermoplastic



Self-densified wood

In-situ polymerization with self-densified wood

Using the removal of water during the drying as the catalyst for polycondensation

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