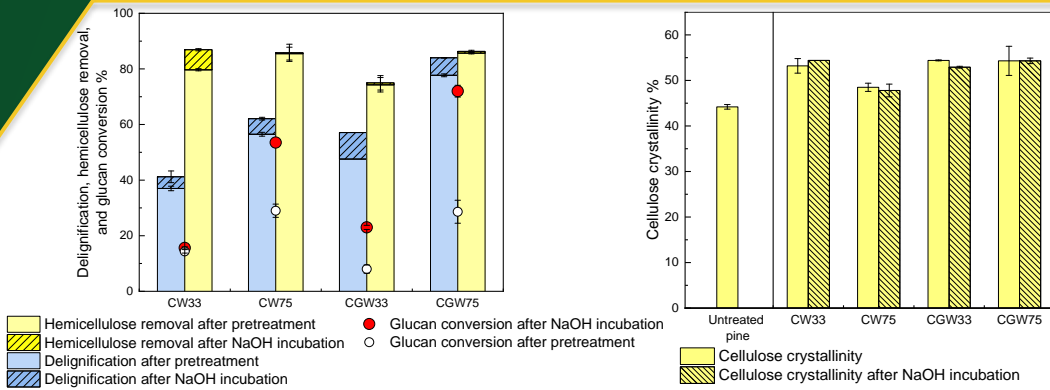
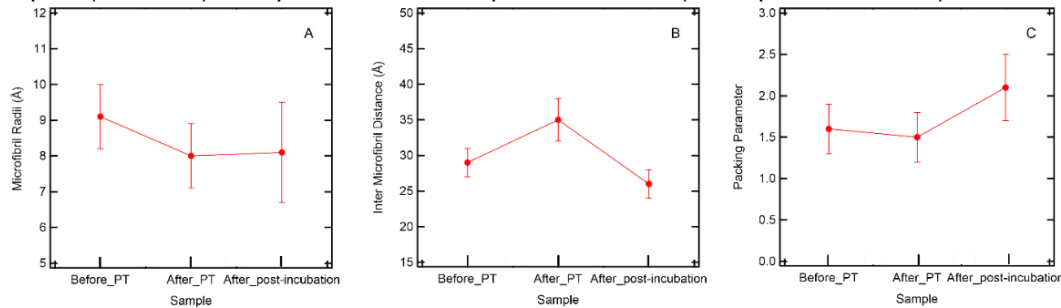


Investigation of Cyrene organosolv fractionation of softwood biomass and alkaline post-incubation



Top: Pretreatment performance (delignification, hemicellulose removal, and glucose yield) and cellulose crystallinity of pine after pretreatment using Cyrene co-solvent with different compositions and after alkaline post-incubation. **Bottom:** The trend in the fitting parameters obtained from SAXS data analysis. A: cellulose microfibril radii, B: inter-microfibril d -spacing, C: packing factor. untreated pine (Before_PT), Cyrene-pretreated pine (After_PT), and pine after alkaline post-incubation (After_post-incubation).



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Scientific Achievement

We effectively fractionated recalcitrant pinewood with a Cyrene co-solvent system. Cellulose microfibril were characterized and the role of alkaline post-incubation on improving fermentable sugar yield was revealed by small-angle X-ray Scattering (SAXS) analysis

Significance and Impact

Efficient fractionation of softwood biomass is vital to the second-generation biorefinery with lignin valorization. Improvements on delignification and alkaline post-incubation are informed by integrating conventional characterization methods with SAXS.

Research Details

- A mixture of Cyrene, water, γ -valerolactone and dilute acid effectively fractionated pinewood at 120°C, leading to 78% delignification and 80% hemicellulose removal.
- After pretreatment and an alkaline post-incubation step, ~70% of glucose yield was achieved with enzymatic hydrolysis.
- Chemical composition and cellulose crystallinity did not change significantly after the post-incubation step, while SAXS analysis revealed changes in microfibrils.
- Cyrene retained on the surface of microfibrils hindered enzymatic hydrolysis which improved after removal by alkaline post-incubation.