

A novel green biomass pretreatment using cellulose-derived solvent Cyrene



Background

- Cellulose-derived solvent Cyrene has been considered as a green alternative to toxic aprotic dipolar organic solvents such as dimethylformamide (DMF). DMF has an excellent ability to dissolve lignin.
- Cyrene has gained significant attention as a green chemistry solvent and is recently becoming more available. However, it has not been tested for biomass pretreatment in future sustainable biorefineries.

Approach

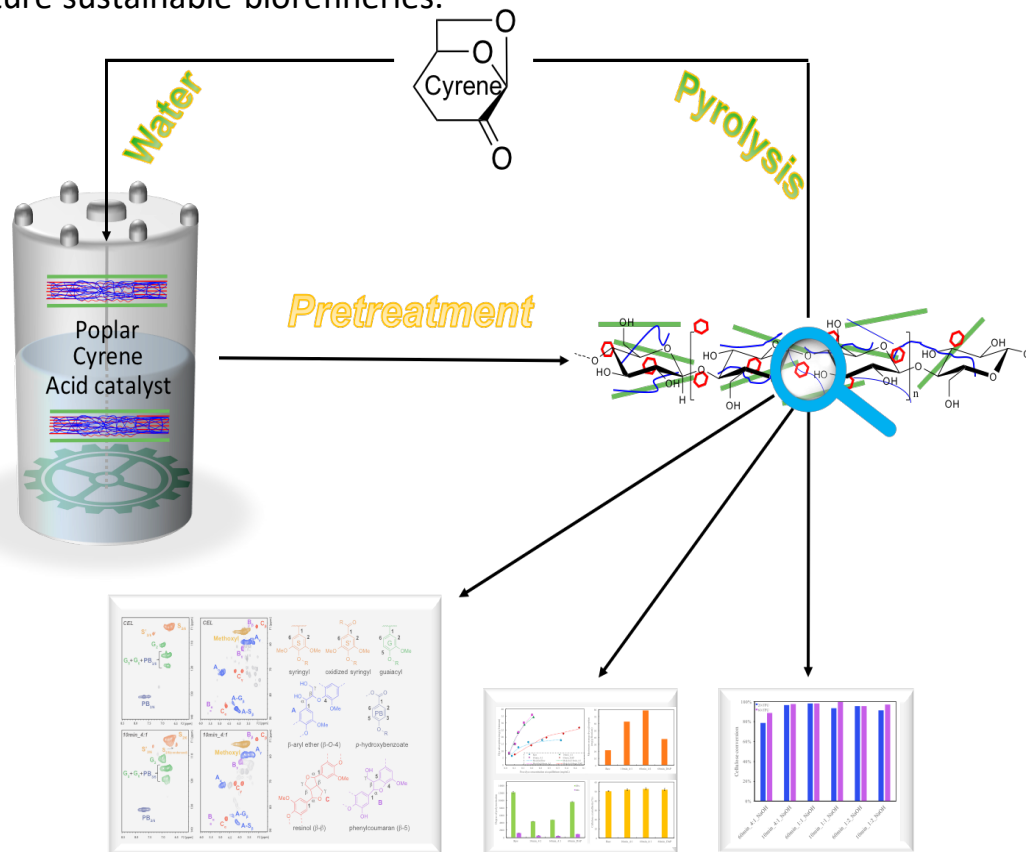
- A novel renewable biomass pretreatment using Cyrene and water co-solvent was developed in this study.

Outcomes

- Lignin has great solubility in Cyrene/water co-solvent and the Cyrene/water ratio was found to play a critical role in lignin solubility due to the presence of strong hydrogen bond between Cyrene and water.
- The addition of Cyrene during biomass pretreatment helps improve lignin removal, creates more cellulose reducing ends, and significantly increases the accessible surface area of cellulose.
- Cyrene pretreatment could be performed at a mild condition (120 °C) to reduce the lignin condensation and avoid significant cleavage of β -O-4 linkages without compromising lignin removal or subsequent sugar utilization.

Significance

- The novel biomass pretreatment using this cellulose-derived solvent will further contribute to the realization of a “closed-loop” biorefinery process



A novel green biomass pretreatment scheme using cellulose-derived solvent Cyrene