A journey towards fossil-free world using controlled chemical biomass transformation

Florent Héroguel

Bloom Biorenewables Ltd (route de l'ancienne papeterie, 106, 1723 Marly, Switzerland)
florent@bloombiorenewables.com

The recent reports from the Intergovernmental Panel on Climate Change (IPCC) highlighted the urgency to accelerate the reduction of CO2 emission. Fossil fuels must stay in the ground which implies the identification and implementation of technologies to utilize sustainable carbon sources. Biomass is an abundant and versatile feedstock but its complex structure and composition have so far prevented bio-based products to match the high performances and low prices of their petrobased counterparts which benefit from hundred years of process optimization.

Together with the laboratory of sustainable and catalytic processing at EPFL, Bloom Biorenewables Ltd has developed a biomass valorisation process to unravel these limitations. The technology named aldehyde-assisted fractionation (AAF) is based on a stabilization strategy preventing undesired degradation pathways typically occurring during biorefining through irreversible condensation reactions. The high degree of control results in high yields and selectivities and provides a unique tool for chemical functionalization. Uncondensed lignin can be directly incorporated in cosmetics or depolymerized in high yields to aromatics monomers with applications in fragrances or specialty chemicals and aromatic oligomers for phenol replacement or fuels applications. Hemicellulosic sugars condensation is prevented to yield functionalized building blocks for polymers or solvents markets. Finally, highly crystalline cellulose is obtained as a precursor to textiles or materials. Overall, cross-sectoral multidisciplinary partnerships enabled the development of high quality, sustainable and cost-competitive products and accelerated the industrialization innovative processes.