

# Lignin Valorization: Improving Lignin Processing in the Biorefinery is outlined in *Science*

## Background

- Lignin is a major component of terrestrial lignocellulosic biomass. The effective utilization of lignin is critical for the accelerated development and deployment of the advanced cellulosic biorefinery.

## Significance

- This perspective review offers a rationale for optimism that more value can be derived from lignin within a biorefinery due to current and project research
- Discovery of genetic variants in native populations of bioenergy crops and direct manipulation of biosynthesis pathways have produced lignin feedstocks with favorable properties for recovery and downstream conversion. Advances in analytical chemistry and computational modeling detail the structure of the modified lignin and direct bioengineering strategies for future targeted properties.
- Refinement of biomass pretreatment technologies has further facilitated lignin recovery, and this coupled with genetic engineering will enable new uses for this biopolymer, including low-cost carbon fibers, engineered plastics and thermoplastic elastomers, polymeric foams, fungible fuels, and commodity chemicals
- Lignin is a viable, commercially relevant sustainable feedstock for a new range of materials and uses.
- Future research will continue to establish to what extent the lignin structure in plants can be altered to yield a product that can be readily recovered via pretreatment, and has the appropriate tailored structures to be valorized for materials, chemicals and fuels.

