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Sustainable Production of Fuels and Chemicals from Lignocellulosic Biomass

Ling-Ping Xiao*, Run-Cang Sun

Beijing Key Laboratory of Lignocellulosic Chemistry, College of Material Science and Technology, Beijing Forestry University, Qinghua East Road, Haidian District, Beijing 100083, China

Lignocelluloses are abundant and nonfood-based materials that are considered as the most suitable feedstocks for chemicals, materials and energy production. High carbon storage and productivity make forest biomass the preferred chemical and energy carrier. Lignin is the most abundant biomass constituent in biomass apart from cellulose and hemicelluloses. Because lignin is a polyphenolic macromolecule, it can serve as a renewable source for value-added phenolic chemicals. An integrated biorefinery will rely on the various components of lignocellulosic biomass to produce fuels, chemicals, and products to be economically and sustainably viable. However, most of the current biorefining strategies involve the burning of lignin to recover heat or the production of lignin in a form suitable for burning for residential heating. Given the highly complex, aromatic nature of lignin, it is an extremely attractive candidate for converting into co-products with an inherent value that may help offset the overall production costs of biofuels. Consequently, our research group focuses on the fractionation of lignocellulosic biomass into its polymeric and non-polymeric constituents and developing new routes for their chemical and biochemical conversion into high-value added products. Moreover, we develop fundamental knowledge on catalytic conversion of biomass to fuels and bulk chemicals via hydrogenolysis and valorization of lignin and the conversion of C_5- and C_6-sugars.

***Corresponding author:** Ling-Ping Xiao, Beijing Key Laboratory of Lignocellulosic Chemistry, College of Material Science and Technology, Beijing Forestry University, Qinghua East Road, Haidian District, Beijing 100083, China, E-mail: lingpingxiao@gmail.com

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