

Lignin and cellulose based materials for energy and environmental applications

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Abstract

My lab of Bioenergy and Bioproducts at the University of Wisconsin-Madison is developing innovative technologies to convert lignocellulosic biomass into high-value products including liquid fuels, platform chemicals, and functional materials. In this presentation, I will briefly introduce the research interests and activities in my lab and then focus on our recent projects on lignin and cellulose-based materials for energy and environmental applications. We explored lignin applications as a polyol in polyurethane, an antioxidant, a metal scavenger for water treatment, and the lignin-derived porous material for producing freshwater from seawater. We developed an approach to fabricate lignocellulose-based materials (1D cellulose nanocrystals, 2D films, and 3D hydrogels/aerogels) from cellulose and even directly from wood via a process of swelling/dissolution and regeneration and demonstrated their applications in metal removal from water, aldehyde scavenging from indoor air, and energy harvest via triboelectric nanogenerators.

Dr. Xuejun Pan is the Vilas Distinguished Achievement Professor and Douglas D. Sorenson Professor in the Department of Biological Systems Engineering at the University of Wisconsin-Madison. He earned his Bachelor's, Master's, and Ph.D. degrees in Chemical Engineering (specialized in Pulp & Paper Science and Engineering) at Tianjin University of Science and Technology, China, and a Ph.D. degree in Applied Bioscience at Hokkaido University, Japan. Dr. Pan had worked as a postdoctoral research associate at Georgia Tech, the University of Minnesota, and the University of British Columbia, successively, before joining the University of Wisconsin-Madison as faculty. Dr. Pan's research interest is in the development and fundamental understanding of innovative technologies for converting lignocellulosic biomass into liquid fuels, platform chemicals, and functionalized materials. Dr. Pan has been honored with the Vilas Distinguished Achievement Professorship (2022), Douglas D. Sorenson Professorship (2022), Andrew Chase Award of AIChE (2021), Vilas Midcareer Award (2018), Alfred Toepfer Faculty Fellow Award (2011), and NSF Career Award (2009). He is an elected Fellow of the International Academy of Wood Science (2013).

This seminar counts towards the ME 600 seminar requirement for Mechanical Engineering graduate students.

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