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Conversion of wood hemicellulose into fully bio-based products

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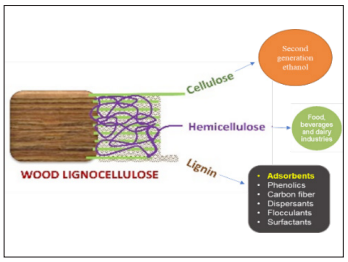

Biorefining is an important means to mitigate climate change. Lignocellulosic resources like woody biomass are excellent starting materials to produce biofuels, biochemicals and biomaterials. The cellulose component of such biomass has been the focus of considerable research. However, the recalcitrant nature of this natural polymer makes it difficult to use economically. The focus of this presentation will be on the utilization of hemicellulose to produce value added products. We have successfully demonstrated the production of several valuable products such as xylitol, succinic acid and levulinic acid from hemicellulose. An efficient detoxification process developed in our lab makes the components of hemicellulose more amenable to fermentation and resulted in the highest yield of xylitol. Another innovative approach has been designed to produce bio-succinic acid from hemicellulose in a single step using a biphasic reactor. Polyurethanes (PUs), mainly produced from petroleum sources, exhibits versatile properties suitable for different applications like foams, adhesives, coatings and sealants. We have reported the production of microbial oil from crude biodiesel-based glycerol. We are presently working on bioconversion of the microbial oil produced from hemicellulose streams to polyols. We are also developing an alternate route to produce isocyanate, which is the other important component to produce polyurethane foams. The overall aim of this study is to produce fully bio-based products which eliminates the use of toxic material like phosgene and reduces the use of fossil-based resources which have a much higher carbon footprint.

Biography

Sudip K Rakshit is a Canada Research Chair (Tier-1) in Bioenergy and Biorefining processes attached to the Biorefining Research Institute and the Department of Chemical Engineering at Lakehead University, Canada. He has completed his PhD program from the Indian Institute of Technology, Delhi, India and subsequently joined the Chemical Engineering Faculty of IIT, Madras. In 1995, he joined the Asian Institute of Technology (AIT) as a Professor in Food Engineering and Bioprocess Technology. He has served as the VP Research for the institute from 2005 to 2012, before moving to Canada. He has supervised more than 100 graduate students including 25 PhD students and has more than 140 publications in international peer reviewed journals and three patents. He is a Life Member of the Indian Institute of Chemical Engineers (IIChE); Foundation Member of the Asian Association of Agricultural Engineers (AAAE) and a Professional Engineer (PEng) in Canada.

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