

Abstract of Presentation

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Presentation Title(Should be no more than 20 words):

Comprehensive utilization of woody biomass components

Abstract :

Woody biomass has drawn much attention as an alternative to fossil resources to create sustainable society because of its abundance on the planet. I am studying the development of efficient separation process for woody biomass components, and utilization of separated components, lignin utilization in particular.

Lignin is known as a by-product from conventional pulping process as well as bioethanol production, and is burnt for energy recovery. Lignin utilization is a very important subject to use biomass as an invaluable organic resource. Our research group has found fusibility of lignin isolated from birch wood by the atmospheric acetic acid pulping. On the basis of knowledge of its fusibility, the lignin was transformed into fibers by melt-spinning. The obtained fibers were finally converted to carbon fibers by thermostabilization followed by carbonization. On the other hand, softwood lignin isolated by the same pulping did not show fusibility, but this lignin was also converted to fusible material by removing a high molecular-mass fraction, and transformed into carbon fibers. These carbon fibers were further functionalized to activated carbon fibers with large specific surface area and excellent adsorption performance.

The hardwood acetic acid lignin was also chemically modified to amphiphiles with epoxylated polyethylene glycols. The obtained derivatives were found to be useful as a water-soluble support for cellulase immobilization that held a long-term enzymatic activity as well as detergent and dispersant for cement.

We further demonstrated the conversion of unbleached pulp to body-temperature responsive hydrogels and the conversion of hemicelluloses-derived monosaccharides to bacterial cellulose with higher performance than plant cellulose by microbial transformation.

In this presentation, I would like to introduce my research projects mentioned above, and a recent research project that deals with an artificial woody cell wall created by the reconstruction of separated wood components.