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เรื่อง RECOVERING LIQUID LIGNINS FROM KRAFT BLACK LIQUORS: SOLVATION AND CHARACTERIZATION

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RECOVERING LIQUID LIGNINS FROM KRAFT BLACK LIQUORS: SOLVATION AND CHARACTERIZATION

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ABSTRACT

In this work, a set of softwood lignins were recovered from a Kraft black liquor using a novel pH-based fractionation process involving sequential CO_2 acidification and separation of the solvated aqueous lignin fraction. These recovered lignin fractions were characterized with respect to properties that may be responsible for their phase-partitioning behavior as well as properties that may render the lignins more suitable for materials applications. Lignin fractions were recovered between a pH range of 12.8 and 9.5, with the bulk of the lignin (90%) recovered between a pH of 11.1 and 10.0. While all the fractions were found to consist primarily of lignin as validated by sample methoxyl content, the first fractions to phase separate were found to be especially enriched in aliphatic extractives and polysaccharides. From the bulk of the lignin that was recovered between a pH of 11.1 and 10.0 a number of noteworthy trends were discernible from the data. Specifically, the phenolic hydroxyl content was found to exhibit a strong negative correlation to the fractionation pH and exhibited a nearly 50% increase with recovery at decreasing pH, while the GPC-estimated molecular weight showed strong positive correlations to the pH at recovery. The aliphatic hydroxyl content exhibited minimal differences between recovery conditions. Overall, these results suggest that this fractionation approach can generate lignin fractions enriched in select physical or structural properties that may be important for their application as feedstocks for renewable chemicals or materials.

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Education

Ph.D., University of Delaware, 1985
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Research Interests: Separations, Thermodynamics, and Supercritical Fluids

The focus of Dr. Thies's work is on separation processes where thermodynamics and phase equilibria play a major role, with an emphasis on dense gases and supercritical fluids as the separating agents. Energy- and materials-related applications are of particular interest. Projects of current interest include thermochemical cycles for the large-scale, "carbon free" production of hydrogen by water-splitting; dense-gas extraction for the molecular design of carbonaceous pitches for advanced carbon materials; the development of an equation of state for predicting liquid crystal formation in carbonaceous oligomers; and rapid expansion of supercritical fluids for the synthesis of polymeric and organic nanoparticles.

Selected Publications

Velez, J.; Thies, M.C. pH-based Fractionation and Physical Characterization of CO_2-Precipitated Lignin. Submitted for publication in *Bioresour. Technol*., 2013.

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