CATALYTIC TRANSFER HYDROGENOLYSIS OF ORGANOSOLV LIGNIN USING NiFeB NANO ALLOYS

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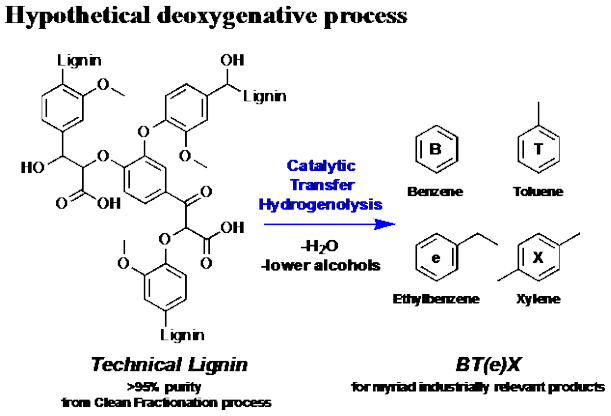
Approximately 50% of the total revenue of the petrochemical refining industry comes from the production of platform and fine chemicals (Bailey 2015). These chemicals are produced from feedstocks that consist primarily of carbon and hydrogen atoms, and catalysts are used to convert these raw feedstocks into higher value products in more than 85% of these operations. In contrast, analogous biorefining operations that use lignocellulosic biomass fractions as feedstocks require novel catalytic strategies for the production of platform chemicals. In this case, the feedstocks are highly oxygenated, and because target platform chemicals contain little or no oxygen, selective deoxygenation strategies need to be employed. Lignin is a multiaromatic heteropolymer produced by plants that could be converted into benzene, toluene, and xylene (BTX, Figure 1). Our group is developing a technology that employs metal boride nano alloys to selectively deoxygenate lignin in near-critical or supercritical ethanol via catalytic transfer hydrogenolysis (CTH). This process selectively deoxygenates lignin while simultaneously preserves the desired aromatic character, and has the potential to afford BTX from lignin. Synthetic procedures for various alloyed and monometallic borides, detailed kinetic measurements using lignin model compounds, and results of the application of these catalysts to biomass-derived technical lignin, including catalyst lifetime and recyclability, will be presented.

Figure 1:



REFERENCE

Bailey, A.; Leong, G. J.; Fitzgerald, N. Summary report from the July 16, 2015, Bioproducts to enable biofuels workshop in Westminster, Colorado. U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Bioenergy Technologies Office. DOE/EE-1294, December 2015.