Renewable Aromatics from Kraft Lignin with Molybdenum-Based Catalysts

dr. Alexander Yuen
Laboratory of Advanced Catalysis for Sustainability
School of Chemistry - The University of Sydney

The depletion of fossil fuel resources, coupled with the growing concern over climate change, has prompted global efforts to explore more sustainable routes to generate fuels and chemicals. Lignocellulosic biomass has been proposed as an important feedstock to supplement dwindling fossil reserves, especially in the context of renewable chemicals. A key driver of activity in this area is the development of new processes to upgrade waste material from existing industries. To date, lignin is the least valorised fraction of woody biomass: the vast majority of it is recovered from spent black liquor by the pulp and paper industry and used as boiler fuel for energy recovery, rather than being upgraded to higher-value platform chemicals.

The main technical difficulties for processing lignin are attributed to its complex, irregular structure and its propensity for repolymerisation during thermochemical depolymerisation (e.g. pyrolysis and solvothermal liquefaction). Nevertheless, it is an attractive feedstock as it is the most abundant, available source of renewable aromatic compounds in the terrestrial biosphere. Of the many target products that can be produced from the successful conversion of lignin, phenol(s) and BTEX-type arenes are particularly attractive economically due to their market volumes.

The results of our recent success in hydrodeoxygenation of waste lignin to simple arenes will be discussed in this talk. Of key importance is the use of supercritical ethanol as both the solvent and source of hydrogen in the presence of heterogeneous molybdenum hemicarbide catalysts.