Functional Nanoporous Materials for Lignocellulosic Biomass Conversion

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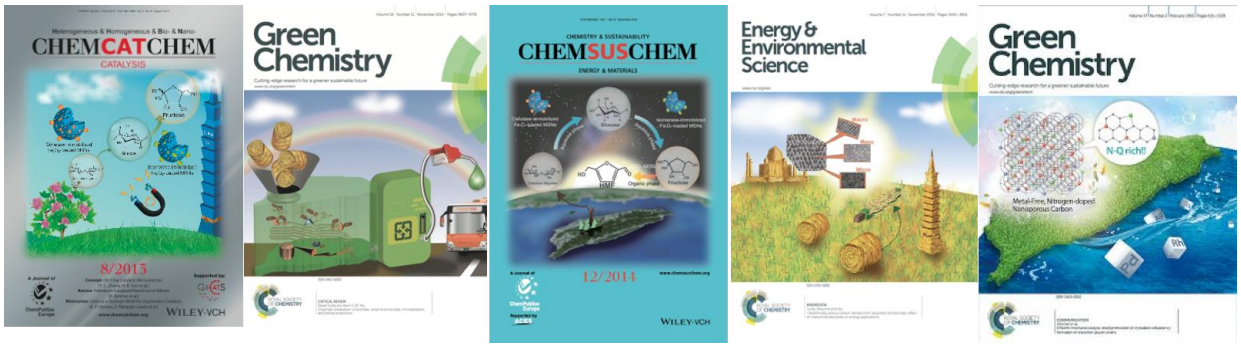
In this presentation, I will demonstrate the successful synthesis of functionalized nanoporous materials including metal-organic frameworks (MOFs) and mesoporous silica nanoparticles (MSNs) as an effective, reliable, and re-usable solid catalysts for lingocellulosic biomass, including lignin, hemicellulose and cellulose conversion. For lignin conversion, an efficient super acidic MOF-808 catalyst will be discussed. For hemicellulose conversion, we use acidic ionic liquids as homogeneous catalysts for producing C5-sugars and furfural. The generated furfural is further converted into 1,5-pentanediol (PDO) using Pt-embedded MIL-53-NH_2 as an efficient catalyst. For cellulose conversion, we first use enzyme-assisted catalytic system for cellulosic hydrolysis (cellulose-to-glucose-to-fructose) and then use acidic MSNs for fructose-to-5-hydroxymethylfurfural (HMF) conversion. HMF is one of the most promising platform of lignocellulosic biomass for generating fine chemicals such as dimethylfuran (DMF) and 2,5-furandicarboxylic acid (FDCA) through hydrogenation/hydrogenlysis and oxidation, respectively. The results obtained in this study indicated that high yields of DMF and FDCA could be separately obtained from HMF via the combination of our newly designed MOFs-based nanoporous catalysts with the liquid-phase hydrogen/oxygen sources.



References

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