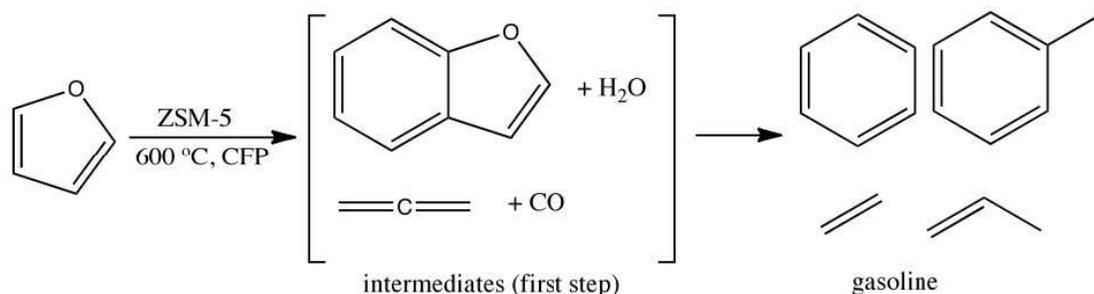




Renewable Aromatics and Olefins from Solid Biomass by Catalytic Fast Pyrolysis: Design of New Generations of Zeolite Catalysts

This research was conducted by the group of George Huber at University of Massachusetts Amherst.

Researchers at the University of Massachusetts Amherst are developing a single-step process to convert solid biomass (including wood, agricultural wastes, and energy crops) directly into aromatics and olefins with zeolite catalysts in a fluidized bed reactor in a process called catalytic fast pyrolysis. This process can be used to make a range of different aromatics or olefins that fit seamlessly into the petrochemical or liquid transportation fuel infrastructure. While zeolite catalysts have been used primarily for conversion of petroleum products, little research has gone into designing zeolites for biomass conversion. The catalytic reaction chemistry of biomass-derived molecules inside zeolites is poorly understood. In CCEI, we are studying the reaction of model biomass-derived molecules inside zeolites using a combination of in situ spectroscopy, temperature programmed reactions, detailed kinetic studies, leaching studies, new synthesis procedures and computational chemistry^[1]. Understanding the catalytic chemistry is leading to the development of new generations of zeolite catalysts that are specifically designed to convert biomass-derived molecules into higher yields of aromatics and olefins. Exciting recent results have shown that these new catalysts are able to generate benzene in a 50% higher yield compared to previous zeolite catalysts. Catalytic fast pyrolysis has been licensed to a start-up company (Anellotech) that is focused on commercializing this technology.



Catalytic fast pyrolysis of furan (a model biomass compound) conversion into gasoline-range aromatics and olefins is initiated by going through benzofuran and allene as intermediates.

RELEVANT PUBLICATION:

[1]Carlson, T.R.; Cheng, Y.T.; Jae, J.; Huber, G.W., “**Production of green aromatics and olefins by catalytic fast pyrolysis of wood sawdust,**” *Energy & Environmental Science*, 4(1), (2011). [DOI: 145-161]