Lewis Acid Zeolites for Production of Biorenewable *p*-xylene

Scientific Achievement

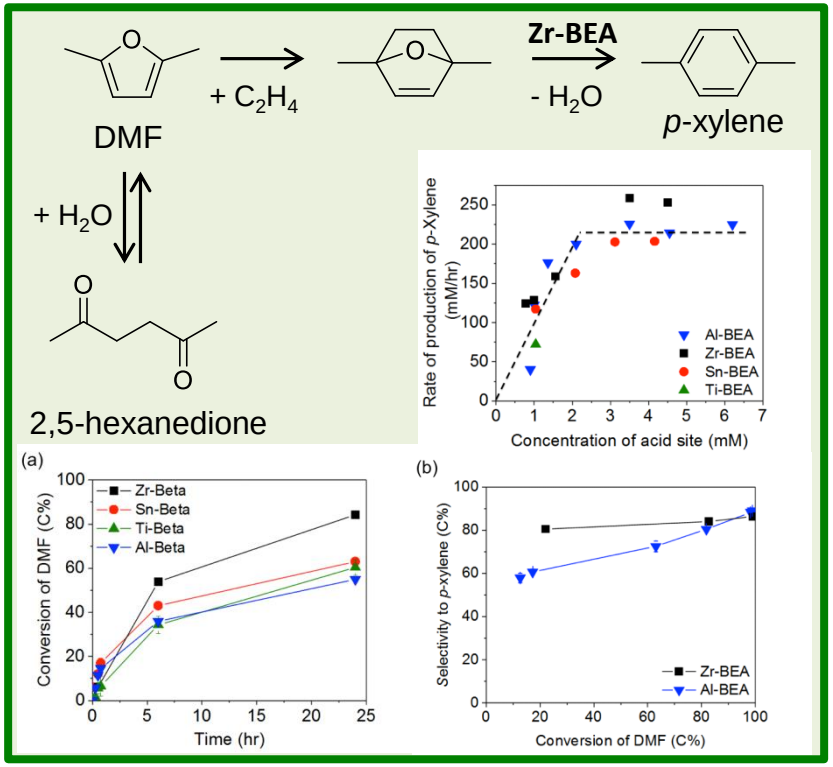
Lewis acid zeolites (Zr-, Sn- and Ti-BEA) were developed for tandem Diels-Alder cycloaddition and dehydration of 2,5-dimethylfuran (DMF) and ethylene to p-xylene achieving the highest selectivity of 80% at 99% conversion of DMF, with improved recalcitrance to deactivation.

Significance and Impact

- p-Xylene is a major commodity chemical for the production of polyethylene terephthalate (PET).
- Development of active and stable Lewis acid zeolite catalysts with improved recalcitrance to deactivation provides economic and technical feasibility.

Research Details

- Zr-BEA zeolite catalyst is active for cycloadduct dehydration to produce p-xylene with higher yield and slower catalyst deactivation than Brønsted acid Al-BEA.
- The superior performance is due to reduced hydrolysis to 2,5-hexanedione and the its weak acid nature which prevents the polymerization of 2,5-hexanedione and DMF.
- Two kinetic regimes (dehydration-limited, cycloaddition-limited) were observed similar to Brønsted acid zeolite catalysts.



C.-C. Chang, H. J. Cho, J. Yu, R. J. Gorte, J. Gulbinski, P. Dauenhauer and W. Fan, *Green Chemistry*, **2016**, 18, 1368-1376

U.S. DEPARTMENT OF ENERGY | Office of Science

Work performed in CCEI at the Universities of Massachusetts, Minnesota and Pennsylvania
CATALYSIS CENTER FOR ENERGY INNOVATION - http://www.efrc.udel.edu/