

Producing Renewable Plastics from Biomass

Scientific Achievement

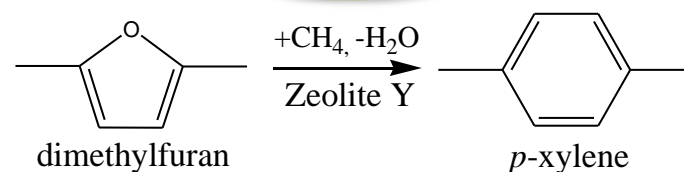
A new catalytic process has been developed for efficiently producing the common plastic precursor, *p*-xylene, from biomass feedstocks with high yield.

Significance and Impact

This discovery opens a new renewable method to convert naturally abundant biomass into the chemicals, which reduces our energy dependence on petroleum and contributes to a sustainable economy.

Research Details

- *p*-Xylene can be produced from biomass-derived dimethylfuran and ethylene using H-Y zeolite with a yield of 75%.
- The reaction involves cycloaddition of ethylene and 2,5-dimethylfuran and subsequent dehydration to *p*-xylene.
- Cycloaddition of ethylene and dimethylfuran occurs without a catalytic active site, but the reaction is promoted by confinement within microporous materials.
- The presence of Brønsted acid sites catalyzes dehydration of the Diels–Alder cycloadduct (to produce *p*-xylene and water).



Williams, C. L.; Chang, C.-C.; Do, P.; Nikbin, N.; Caratzoulas, S.; Vlachos, D. G.; Lobo, R. F.; Fan, W.; Dauenhauer, P. J. *ACS Catal.* 2012, 2, 935-939.

Work was performed at University of Massachusetts–Amherst and University of Delaware