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Bi-functional catalyst for conversion of *2-methylfuran* as a waste biomass derived chemical to biodiesel

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As a part of its plan for energy independence, the US Departments of Energy and Agriculture have set a goal of replacing 30% of petroleum consumed in the US with biofuels by 2030. To fulfill this goal, up to 1 billion dry tons of biomass must be converted into drop-in biofuels at a price point that is competitive with their petroleum counterparts. One of the most energy efficient methods for producing these fuels is through the hydrolysis of cellulosic biomass to produce platform chemicals, which can then be upgraded to diesel fuels. 2-methylfuran (2-MF) is a widely available platform chemical which can be obtained from waste biomass. The current state-of-the-art for upgrading 2MF to diesel requires a complicated multi-step hydroalkylation-hydrodeoxygenation (HA-HDO) process. Each reaction is performed in a separate reactor with each requiring an energy intensive separation. Although, the two-step process produces biodiesel with high yield (87%), the energy efficiency and production rate are hampered by the two-step process. Herein we demonstrate bi-functional catalysts with both HA and HDO sites for upgrading 2-MF in one-step. A series of solid-acid catalysts were screened for HA activity with an aluminosilicate molecular sieve being selected to serve as both the acid catalyst and support for the HDO catalyst (Pt). The bi-functional Pt/MCM-41 catalyst was demonstrated to have high activity and selectivity toward hydrocarbon production from 2MF (93% yield to C8+ hydrocarbons). Spectroscopic data demonstrate a sequential reaction pathway proceeding first through HA on the MCM-41 acid sites followed by HDO on the Pt.

Biography

Hattrick-Simpers completed his PhD in 2007 from the University of Maryland and was a National Research Council Fellow at the National Institute of Standards and Technology from 2007-2010. He is an Assistant Professor in the Department of Chemical Engineering at the University of South Carolina. He has published more than 40 papers in the fields of materials science, functional materials and catalysis.

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