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Catalytic upgrading of biomass pyrolysis vapors

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Catalytic upgrading of biomass pyrolysis vapors is a promising technology for producing renewable, drop-in transportation fuels. Fast pyrolysis of biomass is known to produce high yields (>70%) of carbonaceous liquids that requires after condensation, but expensive upgrading is required. As an alternative, the vapors can be upgraded before they are condensed. This approach has been investigated in the past using microporous acid catalysts such as HZSM-5, which produces gasoline-range hydrocarbons with very little oxygen. However, the yields (10 – 15%) are too low for this to be practical, and further development is needed. This presentation will discuss some of the approaches being pursued at the National Renewable Energy Laboratory improve the yields and the economics of vapor phase upgrading. This includes the development of new catalysts and catalytic processes that efficiently convert the vapors into hydrocarbons as well as an investigation of process conditions to improve yields. A key part of this effort is an investigation of the chemistry and physics of pyrolysis and catalytic reaction. This includes experimental and computational studies of the mechanisms of the conversion realistic model compounds, laboratory screening studies and studies of heat and fluid transfer.

Biography

Mark Nimlos received BS in Chemistry from University of Massachusetts, Boston in 1981 and PhD in Chemical Physics from University of Colorado, Boulder in 1986. Currently he is a Principal Scientist in the National Bioenergy Center at the National Renewable Energy Laboratory (NREL). He has more than 25 years of experience in the design and management of complex, multiparty biomass-related research programs and projects, with a focus on thermochemical conversion research. He has served as lead scientist and manager on numerous projects funded by the Department of Energy and by private industry. His responsibilities include DOE reporting, financial tracking and management, staff and subcontractor direction, and coordination of efforts by partner organizations. His areas of expertise are chemical and physical processes in thermochemical biomass conversion, including chemical kinetics and molecular modeling. He has authored or co-authored nearly 100 peer-reviewed scientific papers/book chapters.

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