

Catalytic Conversion of Biomass to Fuels and Chemicals

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1 Preface

In recent years, there has been substantial interest in using renewable resources to produce energy, transportation fuels, and chemicals. This interest stems from several nations' desires to address issues ranging from climate change, sustainability, national security, job creation, and energy independence. Some of this interest has found its way into commercial applications, with deployment of technologies that include high efficiency electric and hybrid automobiles, rooftop solar installations, solar water heating, increasing deployment of commercial wind and solar power, and substantial production of bioethanol and biodiesel. While biofuels, specifically ethanol and biodiesel, have been produced on a commercial scale in both Brazil and the U.S., the large scale production of alternative transportation fuels that more closely resemble petroleum-derived fuels, as well as the utilization of biomass to create sizable amounts of platform or value-added chemicals, remains an active area of research and development.

The publication of this issue is timely, especially in light of the ongoing debates and refinement of energy and emission policies to decrease the negative health and environmental impacts from anthropogenic emissions of green-house gases, particularly the U.S.'s recently announced Clean Power Plan targeting a 32 % reduction of CO₂ emissions by 2030 as compared to 2005 levels, with a corresponding increase in renewable energy. In spite of the push to increase renewable energy production, the use of

biofuels has been under scrutiny and the "food versus fuel" debate has raised ethical questions about the possible effects that biofuel/bioethanol production could have on food prices, particularly if food crops and/or land is utilized for fuel production. In response to these concerns, much research has focused on the utilization of non-food crops, non-farmable land, and improved conversion processes. The processes that are envisioned to convert biomass into valuable products are heavily dependent upon catalysts. As is already the case in most industrial chemical processes, the activity, stability, and selectivity of the catalysts will play a critical role in the overall process economics of biomass conversion processes.

There are tremendous research efforts looking at biomass utilization and this special issue of Topics in Catalysis contains manuscripts that offer a glimpse of some of the research taking place at universities across North America and in the U.S. Department of Energy's national laboratory system. Manuscripts contained in this issue include a broad range of topics, such as the importance of catalysts in process economics, effects of catalyst synthesis procedures and surface properties on reactivity, deactivation, reaction pathways, and upgrading of biomass-derived oils/vapors/model compounds.

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