Hydrothermal Biomass Conversion Strategies for Renewable Hydrocarbon Fuels

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Date and Time: November 13 (Wednesday), 2013, 11:00 am – 12:00 pm
Location: 315 Stinson-Remick
Pizza and soft drinks will be served.

Nearly 40% of the nation’s economy is fueled by petroleum, obtained largely from non-domestic sources, and the nearly exclusive use of petroleum for transportation in the U.S. releases 2 gigatonnes of additional CO₂ to the atmosphere annually. Hydrocarbon fuels derived from renewable biomass sources are highly attractive because of their compatibility with current transportation technologies and infrastructure. Hydrothermal technologies are receiving renewed attention for conversion of “wet” feedstocks (e.g., algae, wastewater biosolids, waste grease) and aqueous-based process streams (fermentation reactors) to liquid fuel products. Processing wet feedstocks in hydrothermal media is ideal because it eliminates energy intensive drying and distillation steps. The aqueous reaction environment changes dramatically under hydrothermal conditions (200 – 350°C, 5 – 15 MPa), promoting the breakdown and reformation of biomacromolecules into liquid bio-oils with increased energy density. Water-stable catalysts can also be applied to hydrothermal reaction environments to facilitate conversion reactions typical of petroleum refining steps (e.g., hydrogenation, decarboxylation, isomerization). This presentation will highlight recent efforts of our team, including (i) direct hydrothermal liquefaction of microalgae, (ii) H₂-free catalytic hydrothermal conversion of lipids and waste greases to hydrocarbon fuels, and (iii) coupling of hydrothermal catalytic processes with biochemical strategies for deconstructing and converting recalcitrant biopolymers into hydrocarbon fuels and other high value refinery target compounds.

Biosketch of Prof. Strathmann

Timothy Strathmann is an Associate Professor and the Snoeyink Faculty Scholar in the Department Civil and Environmental Engineering at the University of Illinois at Urbana-Champaign (UIUC), where he is also founding Co-Director of the Energy-Water-Environment Sustainability (EWES) program. His research focuses on the development sustainable catalytic processes for water treatment and bioenergy applications and the study of redox transformation mechanisms for contaminants of emerging concern (CEC). Prof. Strathmann is the recipient of a National Science Foundation CAREER Award, and his research has been sponsored by NSF, USEPA, USDA, DOD, DOE, and the Water Research Foundation. Dr. Strathmann’s formal training includes a PhD in environmental engineering from Johns Hopkins, BS and MS degrees in civil engineering from Purdue University, and postdoctoral research at Princeton University.