

O 28: Invited Talk (Lanny Schmidt)

Time: Wednesday 9:30–10:15

Location: HSZ 02

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Catalytic Autothermal Reforming of Renewable Fuels at Millisecond Times — •LANNY SCHMIDT — Dept of Chem Eng and Mat Sci, U of Minnesota, Minneapolis MN 55455

Autothermal reactors have great promise for hydrogen and chemicals production because they have reactor residence times of 10⁻³ seconds and require very simple reactors. We describe the production of hydrogen and olefins from fossil fuels from methane to diesel and from renewable fuels such as ethanol, biodiesel, soy oil, cellulose, and lignocellulose in millisecond reactors.

Biofuels generally have higher conversions than fossil fuels because the hydroxyl and ester linkages in these fuels produce higher sticking coefficients than for saturated alkanes. Consequently, conversions of all

biofuels in these processes are nearly 100%. Highly oxygenated feedstocks tend to produce mostly syngas with little olefins or oxygenated products because surface reactions dominate, and these larger products are formed predominantly by homogeneous reaction processes after all oxygen is consumed.

Recent results on production of syngas by reactive flash volatilization of nonvolatile liquids and solids will also be described. We show that, by impinging cold liquid drops or small solid particles onto the hot catalyst surface, the process can be operated in steady state with no carbon formation for many hours. This occurs because, while pyrolysis of vegetable oils and carbohydrates at low temperatures produces carbon, above ~600°C the equilibrium shifts to produce syngas rather than solid carbon.