NRP 70 Industrial processes

Joint project: Production of fuels and commodity chemicals through subsequent biochemical and catalytic conversion of lignocellulosic biomass

Overview

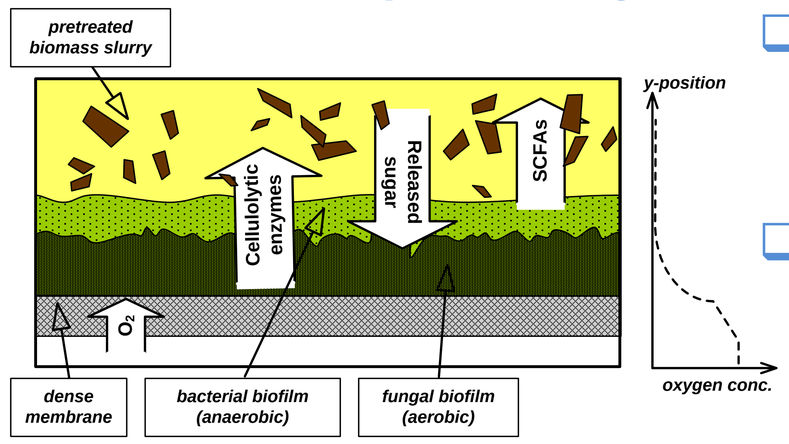
Goal of the project: ***Developing the technology for a new value chain to produce commodity chemicals, diesel and jet fuel from lignocellulosic feedstock***

Approach: Combining biochemical conversion with chemical catalysis and evaluating the overall sustainability.

Expected deliverables:

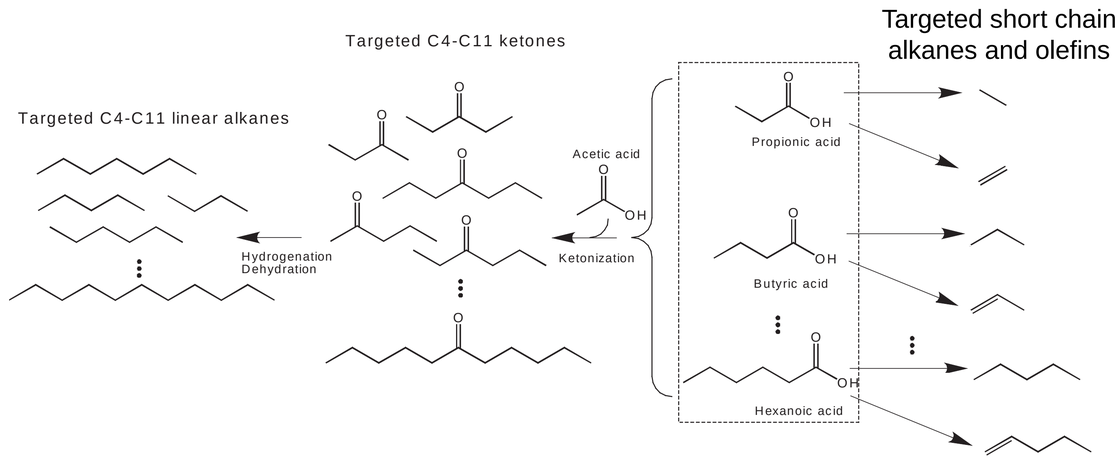
- An integrated ***process for bio-chemically producing carboxylic acids*** from non-edible biomass
- New ***catalytic routes*** for converting carboxylic acids to fuels and α-olefins
- Integrated processing methodologies for ***combining biological and chemical conversion***
- A combined ***techno-economic and sustainability model*** using process modeling and life cycle assessment

Consolidated bioprocessing



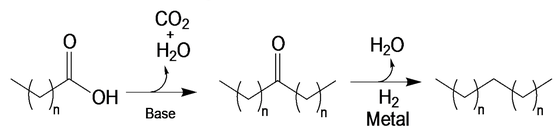
- Developing a robust, integrated process for the biochemical production of carboxylic acids from non edible biomass
- Developing new biochemical routes for producing targeted alkane mixtures and α-olefins mixtures from carboxylic acids

Catalytic upgrading

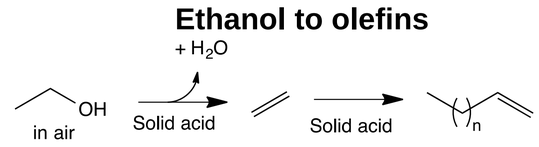


Studied reactions:

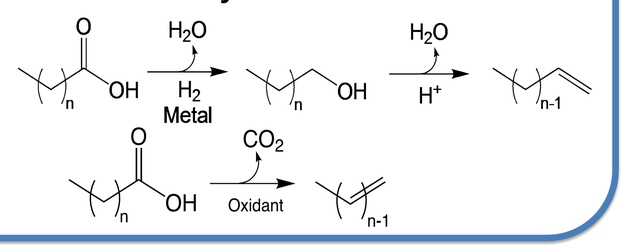
Carboxylic acids to fuels



Ethanol to olefins



Carboxylic acids to olefins

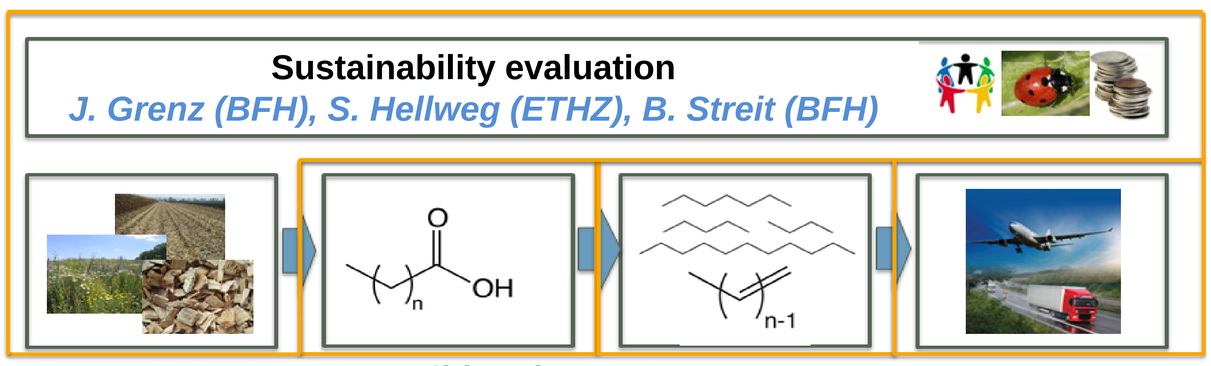


Sustainability and economic evaluation

Evaluating and identifying sustainable biomass conversion pathways using a detailed model of the developed technologies and the entire value chain

Subprojects

Sustainability evaluation
J. Grenz (BFH), S. Hellweg (ETHZ), B. Streit (BFH)



Lignocellulosic feedstock | **Consolidated bioprocessing** | **Catalytic upgrading** | **Market**

M. Studer (BFH) *J. Luterbacher (EPFL)*

D. Herrmann (coordinator)

Industrial advisory board:

J. Sommer (fenaco) · M. Staehelin (SWISSMILL) · J. McNally (INEOS) · J. Lindstedt (LINDAB) · G. Festel (Festel Capital) · F. Maréchal (EPFL) · D. Bergmann (FPT) · E. Nager (RUAG)

Energy Turnaround

Motivation: In 2011, the Federal Council and Parliament decided that Switzerland is to withdraw from the use of nuclear energy on a step-by-step basis. In Switzerland, approx. $1.2 \cdot 10^6$ tones of lignocellulosic biomass are available for producing sustainable fuel and chemicals.

Contribution to main axes of the "Energy Strategy 2050":

- **Increasing the fraction of renewable energy:** Producing biomass-derived alkanes and olefins could both directly and indirectly increase the fraction of renewable energy by providing exact replacements for commonly used liquid fuels and carbon-based chemicals
- **Reinforcing energetic research.**

Contact

Dr. Michael Hans Peter Studer
Bern University of Applied Sciences BFH
School of Agricultural, Forest and Food Sciences HAFL
CH-3052 Zollikofen, E-mail: michael.studer1@bfh.ch