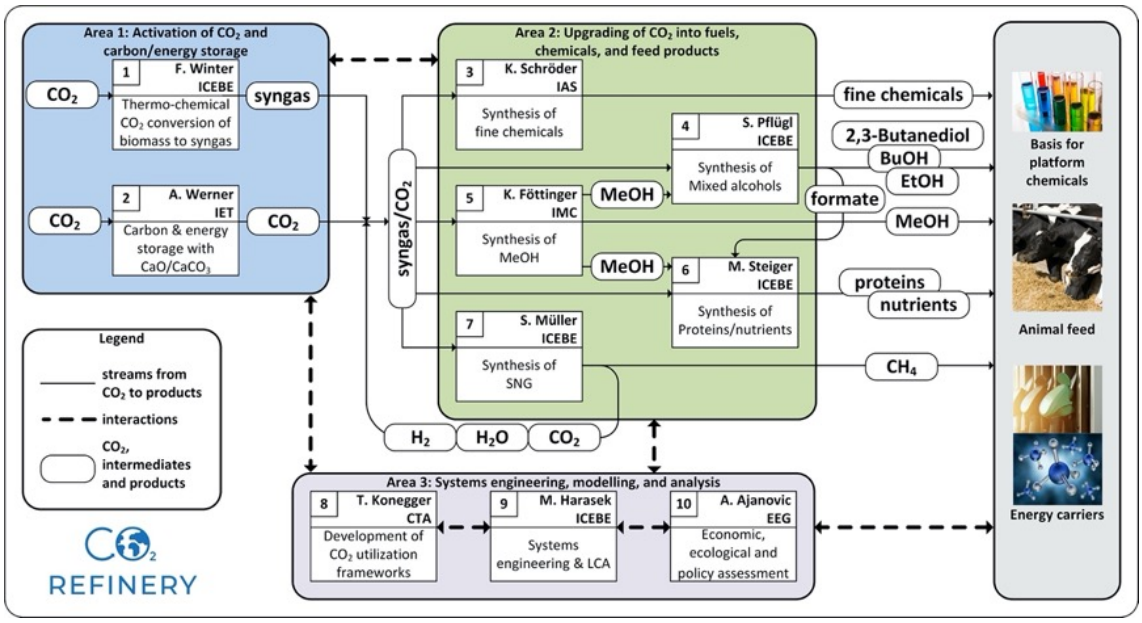
Open Position PhD #6: Synthesis of proteins / nutrients

General

The TU Wien doctoral school **CO_2Refinery** covers a wide range of methods and will integrate multiple disciplines required to implement a fully functional facility for refining and upgrading CO_2 on a technical center scale. With its integrated research and training program, the doctoral school targets to train "**one carbon engineers**" will work together on the development of technologies to efficiently utilize CO_2 as a carbon source to make a broad variety of products using chemical and biological catalysts. In addition to synthesis of products from CO_2, **CO_2Refinery** will focus on the activation of CO_2 for utilization as a carbon source in synthesis processes. Moreover, using renewable resources such as biomass and energy, and energy storage with CO_2 as the scaffold will be investigated. The strategy of **CO_2Refinery** is complemented by research on systems engineering, modelling, and analysis to provide the framework of the individual unit operations. Additionally, life cycle analysis will be used as a powerful tool to evaluate performance of the refinery on an economic scale. The research topics are structured into three research areas as shown below.



Within the proposed research framework, the members of the TU Wien doctoral school will be trained interdisciplinary to obtain a unique skillset. Graduates are envisioned to work at the forefront of groundbreaking research, but also to implement the concepts and ideas of a CO_2 refinery in industry. **CO_2Refinery** offers excellent scientific research, combined with a multi- and interdisciplinary curriculum (lectures and lab rotation) and a dedicated supervision and mentoring program. The PhD students are in the center of attention and their training and scientific advancement is the key to a successful implementation of this program. Research training will be obtained through work embedded into high-quality scientific research environments provided by supervisors that are internationally recognized experts in their fields and the close support through junior faculty members.

Project description:

Microorganisms have the ability to assimilate different C1 molecules including methanol, formate or CO_2 into their biomass. Methanol is a promising intermediate chemical as it can be produced from CO_2 and hydrogen streams or by direct electrolysis of CO_2. It can serve as base chemical, fuel or as a substrate for microbial fermentation. Methylotrophic yeasts like *Hansenula polymorpha* can grow on methanol as sole carbon source and using metabolic engineering approached various chemical compounds can be produced.

Key goals and tasks:

The primary aim of this PhD thesis is to tightly connect the chemical synthesis of methanol with the microbial conversion towards biomass and other value-added products. It will be tested which process design enables an optimal synthesis of methanol and how this methanol stream can be connected to a microbial fermentation. Ideally intermediate process steps, like a methanol purification after synthesis, can be by-passed or left out to reduce the overall process costs. The PhD Different yeast strains will be screened and their process robustness will be evaluated. Applying metabolic engineering approaches different show-case products (proteins, organic acids, vitamins) will be produced by the microbial host. Genetic engineering and adaptive evolution will be used to optimize the respective host organism.

Experience and skills:

- Master studies in chemistry, biochemistry, molecular biology, biology, biotechnology or related
- Lab experience in biochemistry, microbiology, molecular biology, biotechnology
- Skills: cloning, PCR, transformation, cultivation of microorganisms, enzymatic assays, bioinformatic skills, HPLC
- Basic knowledge and interest in designing and implementing new experimental setups, ideally experience in data acquisition and instrument control (e.g. LabView)
- Scientific experience: Presentation, scientific writing, publications, conference attendance.
- Personal skills: independence, creative thinking, systematic and structured work approach, hands-on mentality
- Motivation and willingness to take part in teaching activities

Supervisors:

Matthias Steiger / Stefan Pflügl / Thomas Konegger