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Fakultät III Prozesswissenschaften
Institut für Prozess- und Verfahrenstechnik

Fachgebiet Dynamik und Betrieb technischer Anlagen

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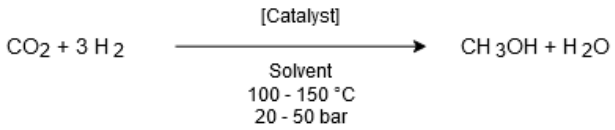
Research internship, master (and bachelor) thesis (experimental / theoretical)

Sustainable, homogeneously catalysed methanol synthesis from carbon dioxide.

Research background:
Methanol plays a crucial role as a key C1 building block, serving as a raw material for the production of more complex molecules, and is also used as a fuel additive. However, the conventional, heterogeneously catalysed process for methanol synthesis is limited by a number of factors that lead to high investment and operating costs.

The homogeneously catalysed synthesis route promises to solves these limitations by carrying out the reaction in the liquid phase at significantly lower temperatures and lower pressures. For this purpose, a mixture of CO_2 and H_2 or synthesis gas - can be catalytically converted with the help of a homogeneous catalyst that is dissolved in a liquid solvent (Figure 1 and 2).



Task:
We have already carried out the first successful investigations into these reactions. Now the reaction must be further optimised. Your tasks are:

- Experimental investigations to increase the conversion of the reaction
- simple parameter studies to assess influences such as temperature, concentration and pressure
- if there is enough time: set up simple kinetics (power law)

Motivation:

- After finishing this thesis, you will have the tool set to upscale homogeneously catalysed reactions.
- You will also understand how catalysis can contribute towards green chemistry.
- In addition, you will gain insights into model development based on experimental data.
- You will have experience in solving industry related tasks; experience what it means to make a reaction economically feasible and sustainable

What we can offer you:

- Close support with all tasks
- Help with modelling
- Help with experiments
- Help with scientific writing
- A chemical material system and method that already works
- Chemical analysis that already works
- Flexible duration

Skills and Knowledge:
You can successfully complete this thesis if you have some experience in the lab and some chemical understanding. Basic knowledge of python would be helpful, but is not necessary. The thesis can be written in English or German.

Contact:
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I can't wait to hear from you :)

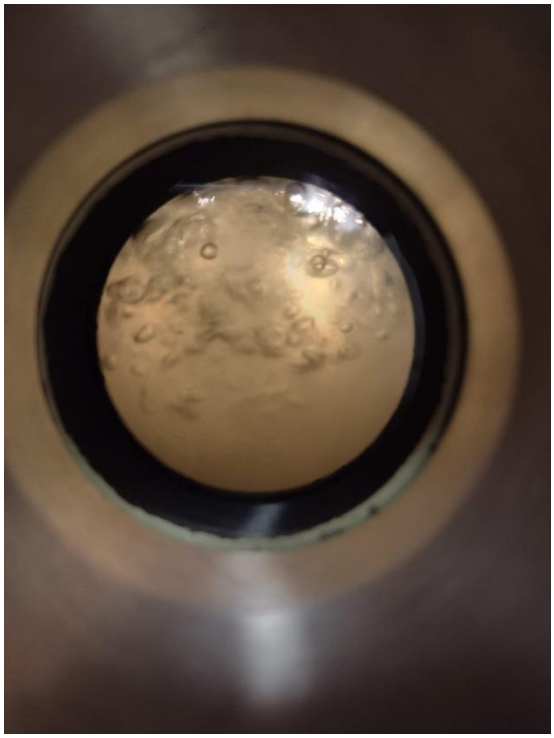

Figure 1 Catalyst during the reaction in the mini plant

Figure 2 solved homogeneous catalyst in solvent