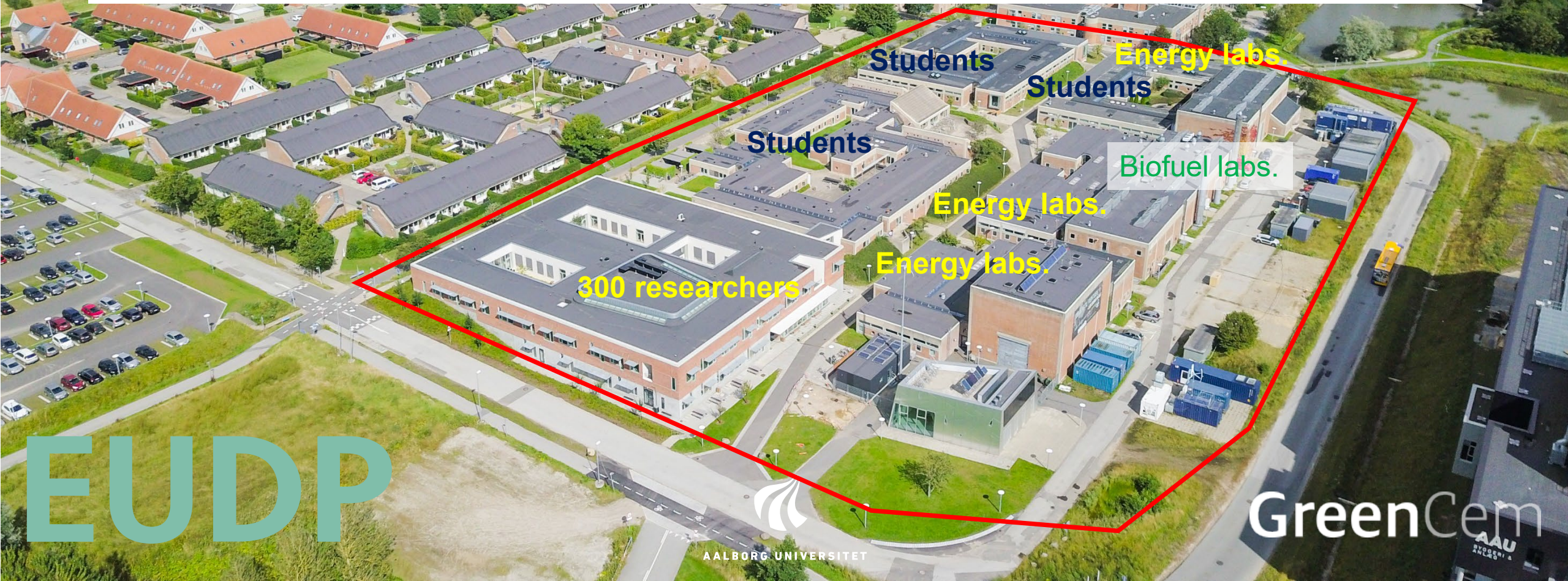


Development of bolt-on reactor and catalyst for direct jet-fuel synthesis

**Kamaldeep Sharma, Salman Haider, Daniele Castello and
Mads Pagh Nielsen, AAU Energy**



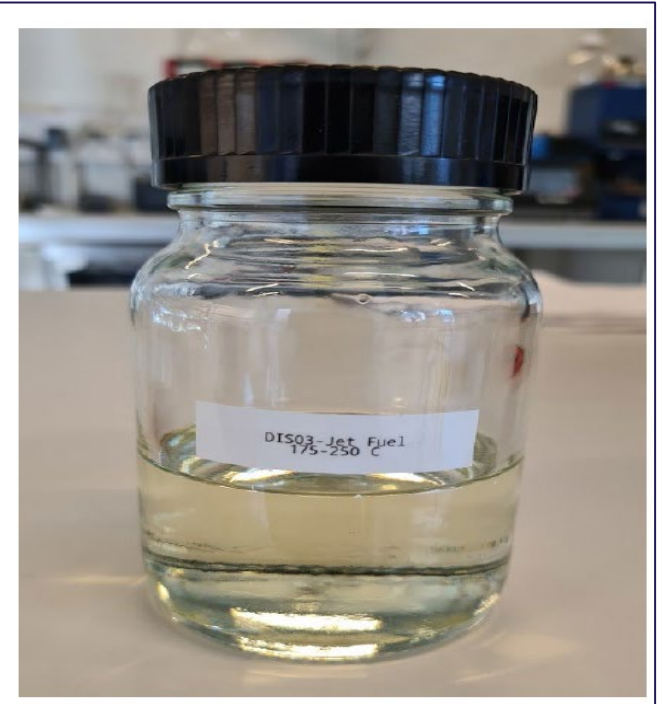
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Energy efficient production of sustainable aviation-fuel (SAF)

We need ~ 100 PJ fuel by 2050!

Have a virtual tour in our labs

<https://www.et.aau.dk/laboratories/renewable-energy-conversion-storage/bio-fuel-laboratory/>



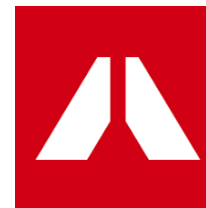
2



Power-2-Met (EUDP) Methanol P2X pilot plant

Purpose: Renewable methanol from biogas-CO₂ and alkaline electrolysis

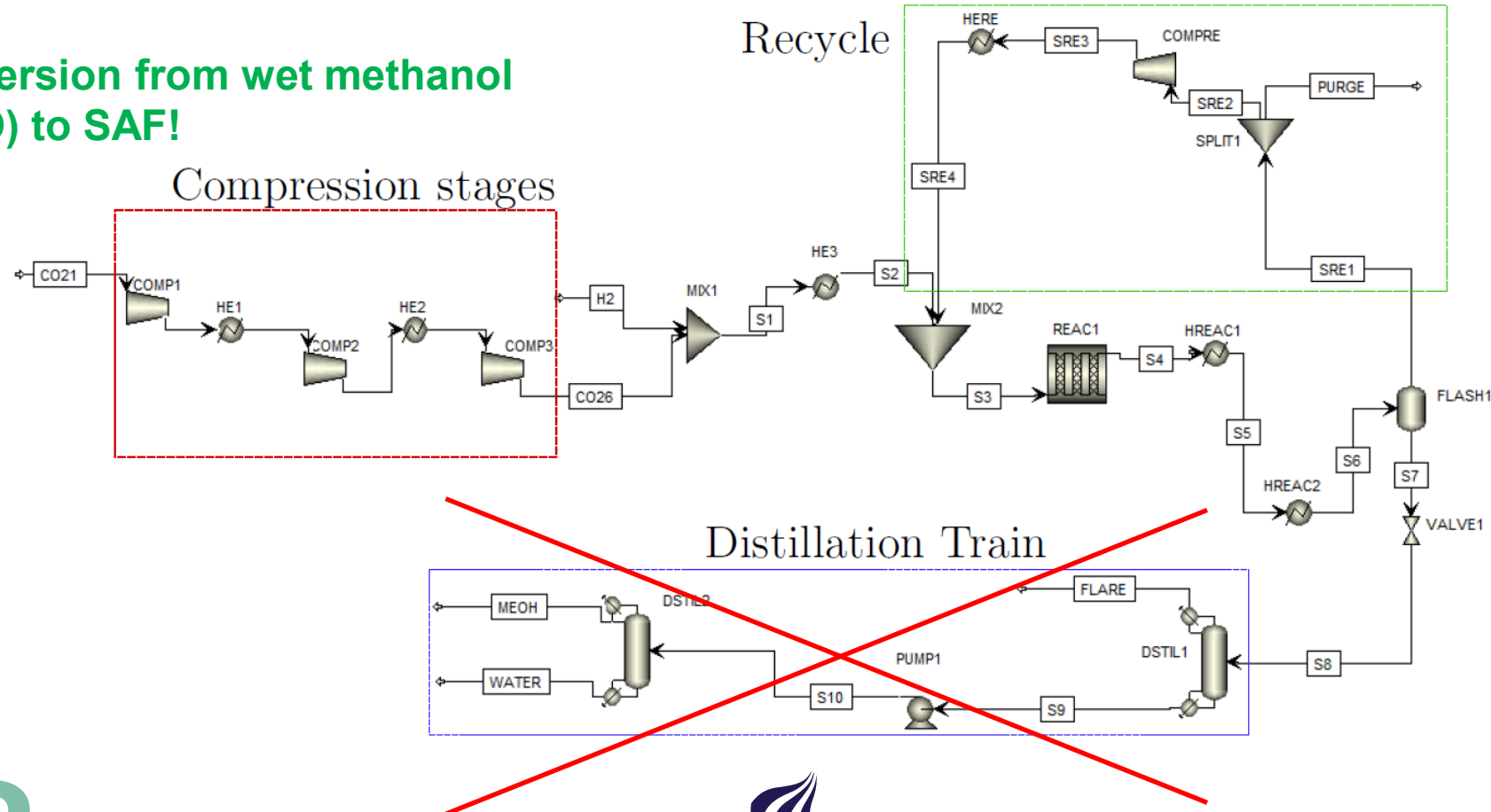
- ▶ Utilizing CO₂ currently depleted to the atmosphere
- ▶ Methanol synthesis successfully tested w. alkaline electrolysis
- ▶ 300,000 liters of methanol pr. year (continuous operation)
- ▶ To be moved to the Port of Aalborg to get more real-life operational experience



Producing aviation fuels bypassing distillation-stages! => Energy savings!

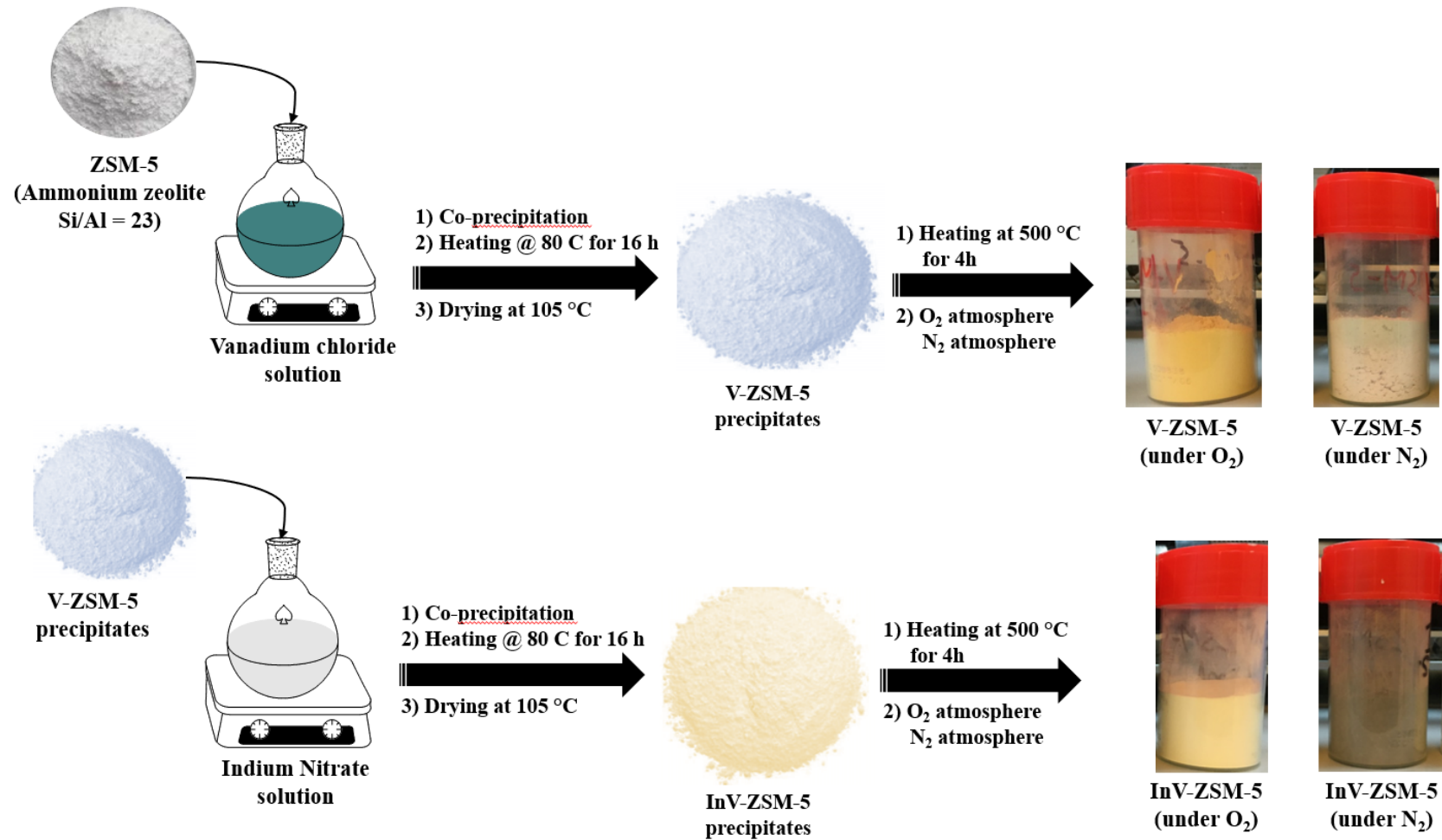
A first bolt-on process has been developed in GreenCEM:

Direct conversion from wet methanol
(MeOH+H₂O) to SAF!



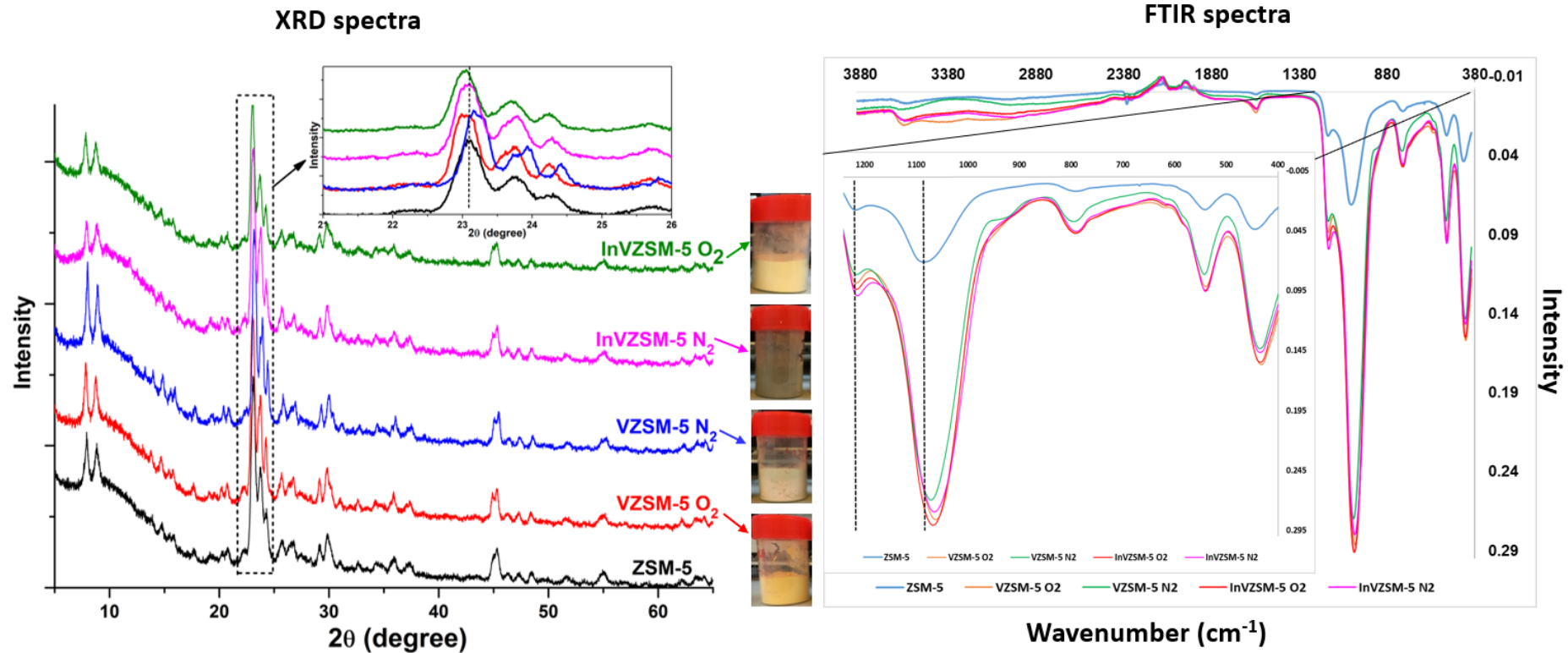
Zeolite Synthesis

5



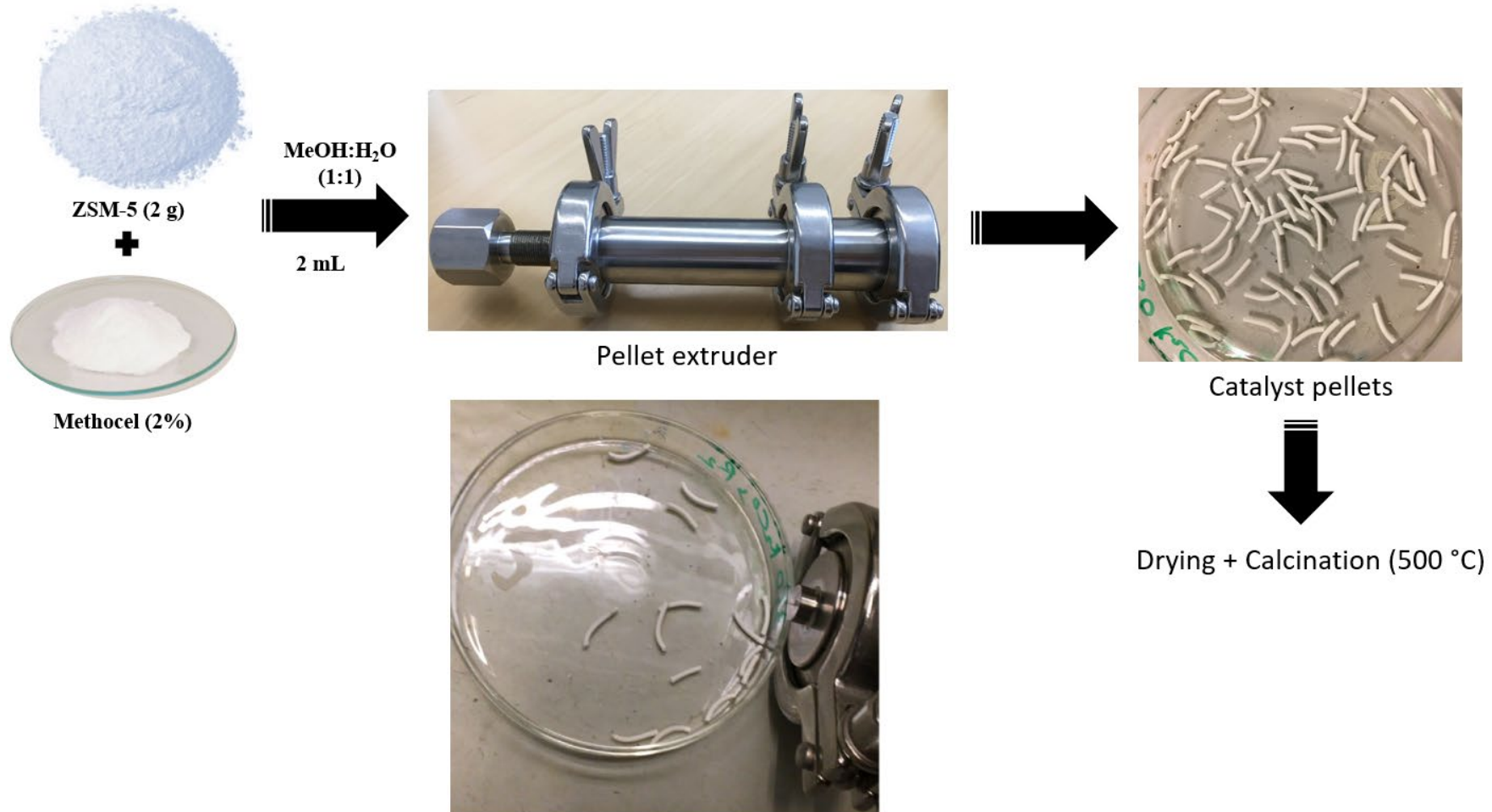
Characterization of the Zeolites

6



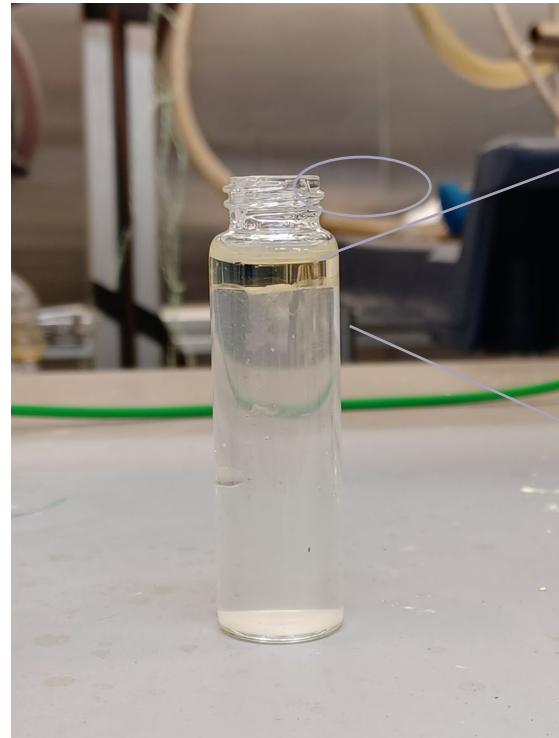
Pelletization of Zeolites

7



Materials, Methods and Setup

- Catalyst: In-house V-ZSM-5 under O₂
- Feed: Methanol (64 wt%): water(36 wt%)
- WHSV (Weight-Hourly-SpaceVelocity): 2 h⁻¹
- Temperature: 350 °C
- Pressure: Atmospheric
-



Product Mixture

Liquid Hydrocarbons
(BTX + etc.)

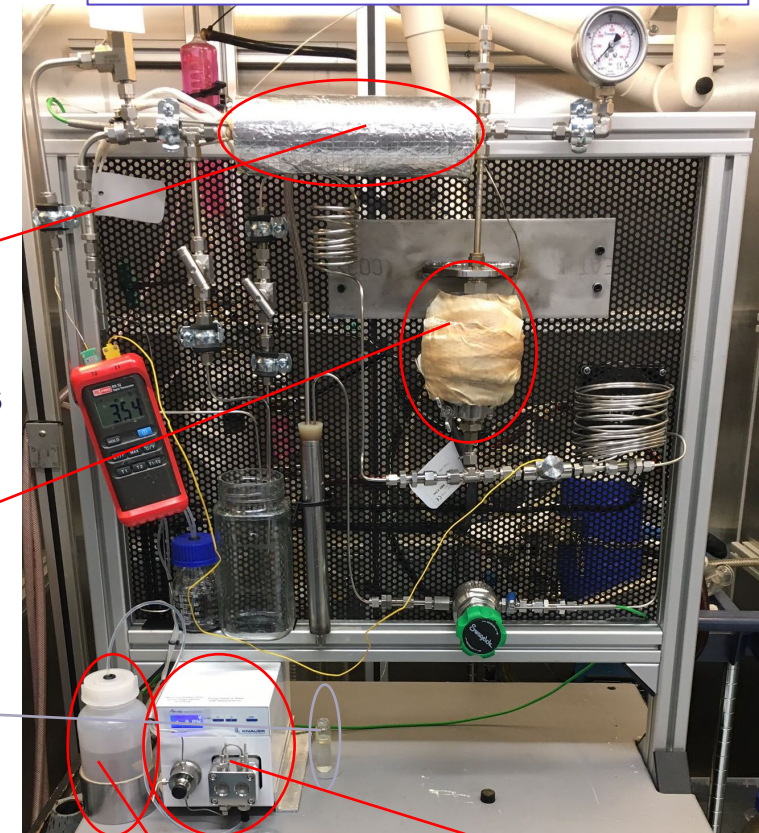
Water

Time-on-stream: 15 hours

Fixed-bed Reactor

Preheating Zone

Semi-continuous Unit-AAU



Feed Vessel-Wet Methanol
(64% methanol water mix.)

HPLC Pump



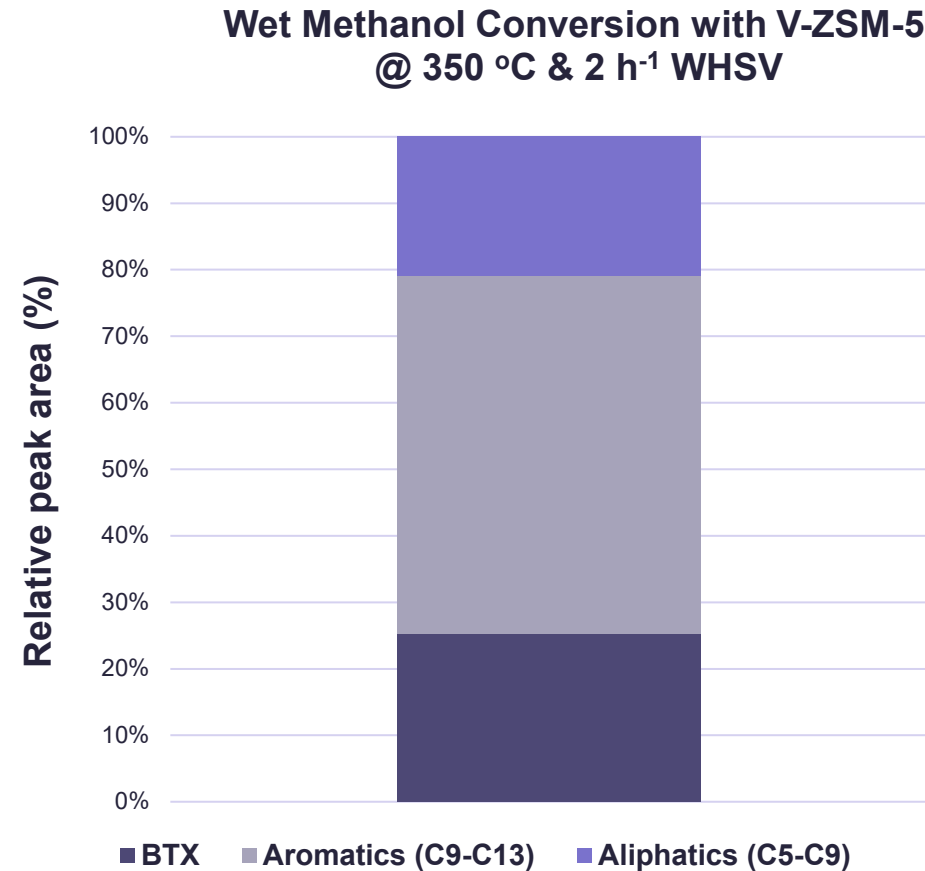
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Results – Selectivity of Liquid Hydrocarbons

(Very first tests performed 28th-29th of April 2022!)

9



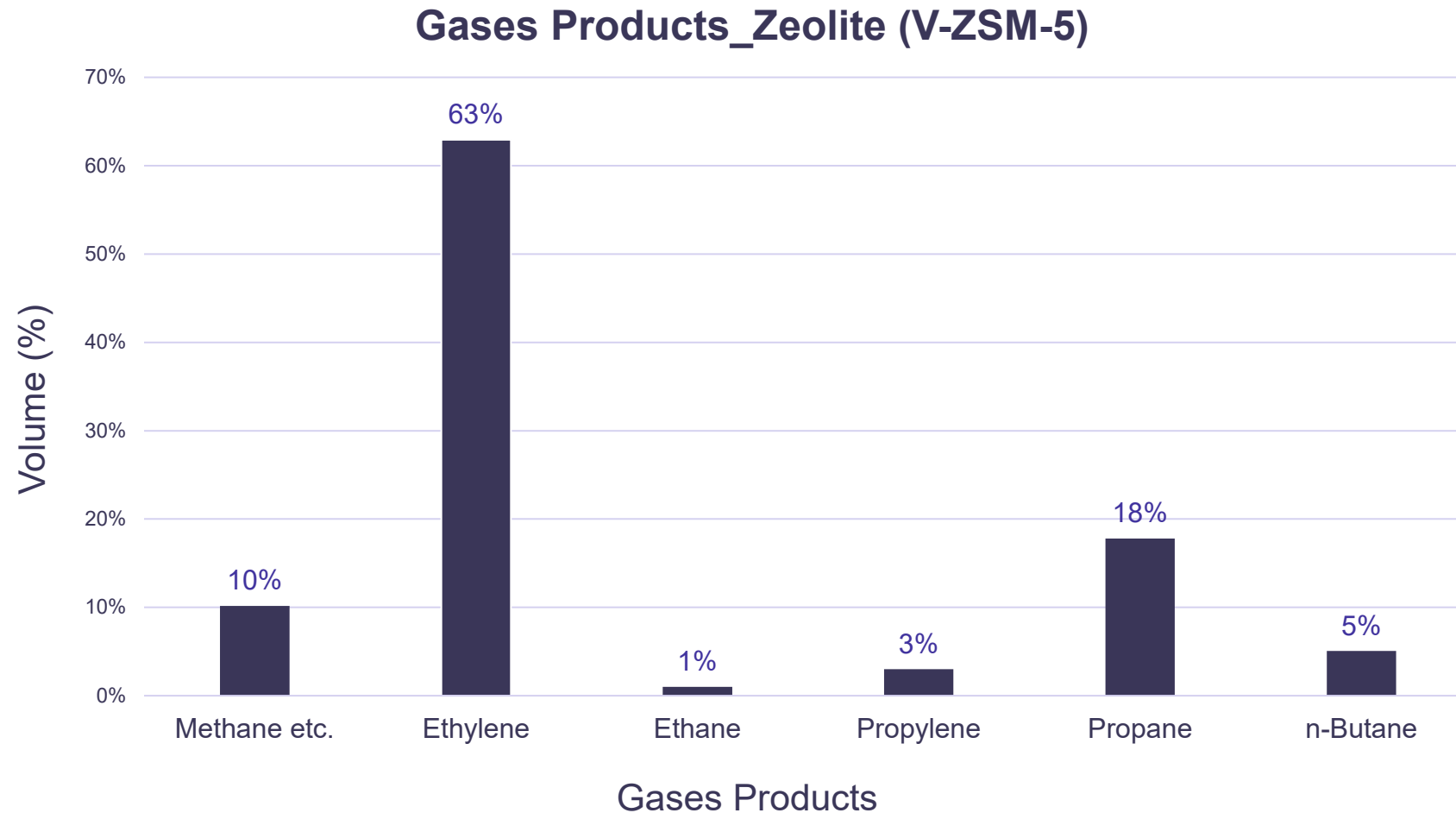
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Results – Product Gases

10



Summary

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- ▶ The GreenCEM EUDP project has brought AAU Energy close to state-of-the-art in terms of developing efficient fuel and SAF-synthesis related to Power-2-Methanol systems.
- ▶ Successful preliminary results. Still several catalyst candidates to be tested.
- ▶ Characterization of synthesized zeolites via SEM, EDX BET will be performed.
- ▶ Stability/selectivity of zeolites during long continuous operation must be tested in the future.

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THANK YOU
(NOT LEAST EUDP 64020-3106 FOR FUNDING THIS WORK!)

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