

Effect of syngas composition on the production of renewable dimethyl-ether (rDME) via Sorption Enhanced DME synthesis (SEDMES)

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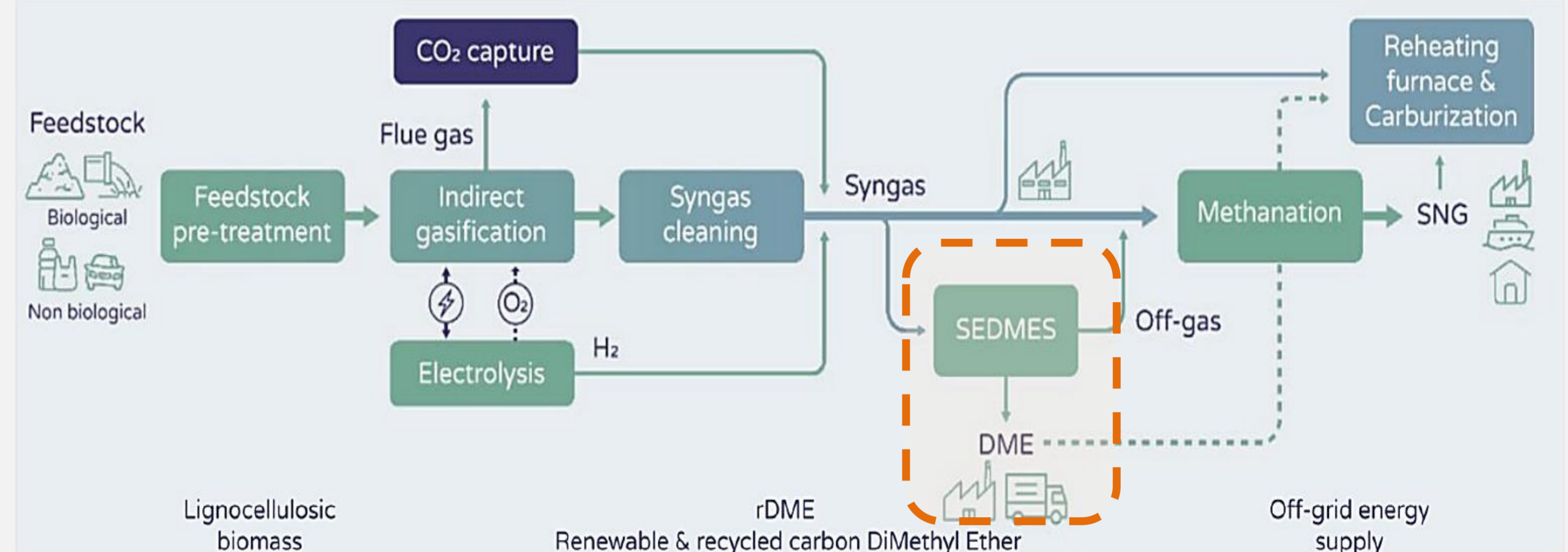
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BUTTERFLY concept and objective of this work

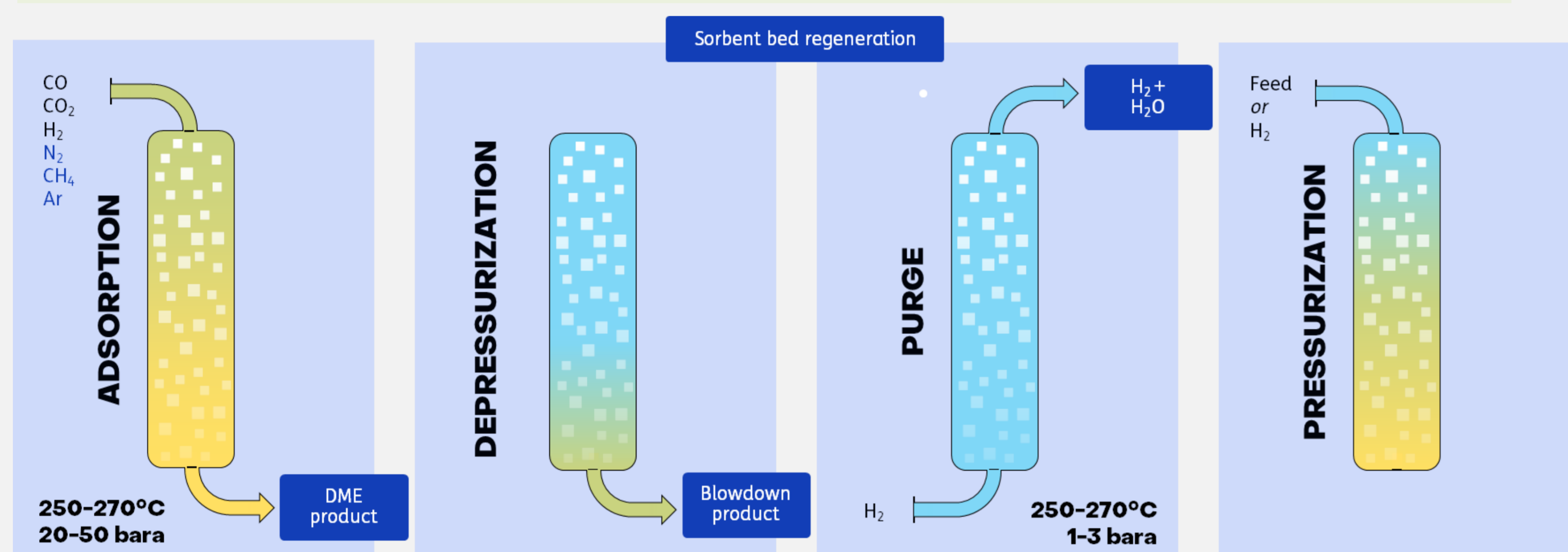
BUTTERFLY (Biomass Utilized To The Extend portfolio of Renewable Fuels with Large Yields) will optimize the synergy of rDME and SNG production, both by integrating the carbon efficiency and by employing the inherent flexibility in processes such as SEDMES.

The **objective** of this specific work is to do a preliminary assessment on the effect of syngas composition on the production of rDME via SEMDES. The results are paving the way towards testing of real syngas as feedstock for SEDMES at TRL 7.

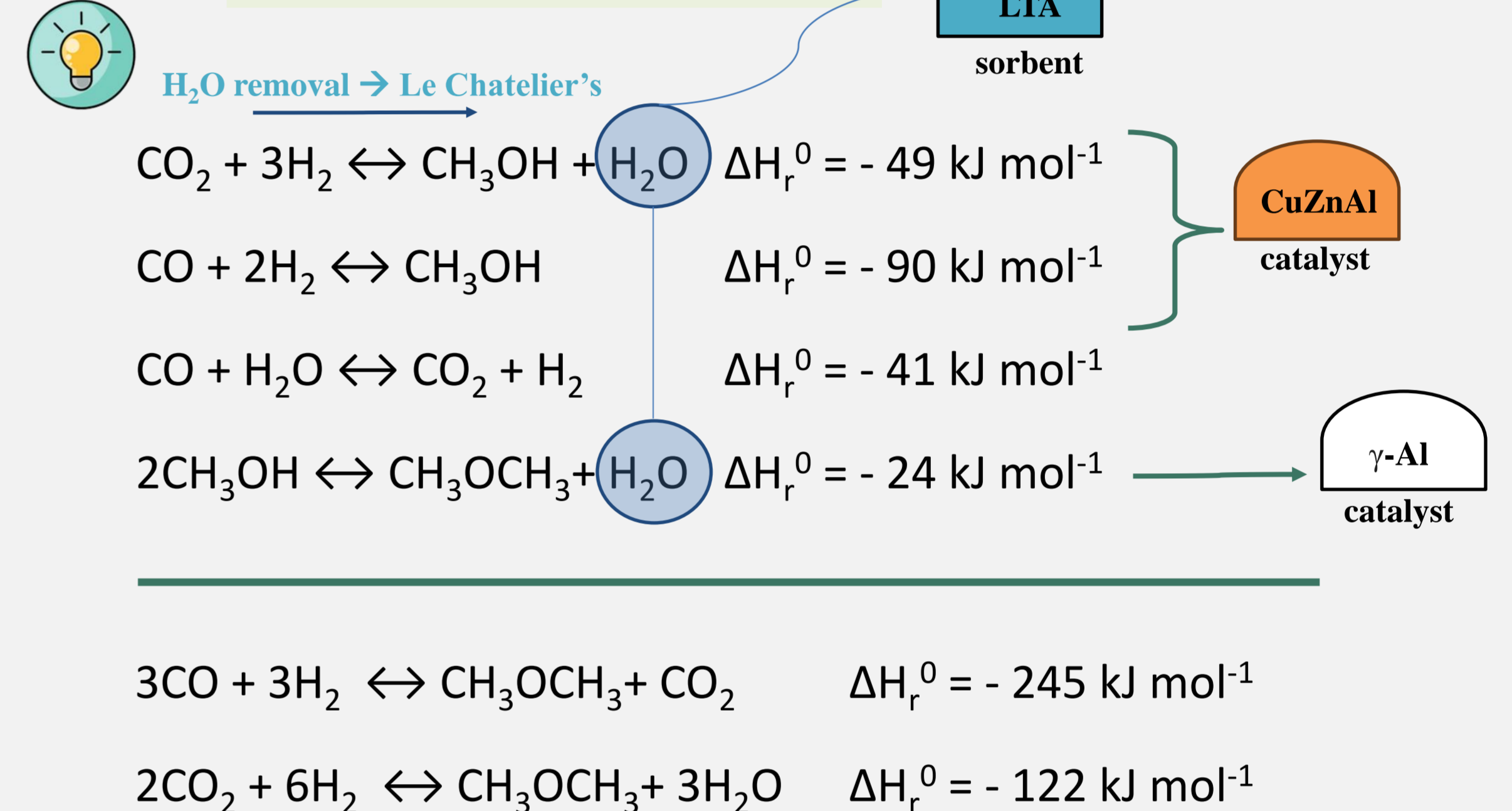


Sorption Enhanced DME synthesis (SEDMES) in BUTTERFLY

SEDMES Pressure swing adsorption (PSA) operation



SEDMES reactions

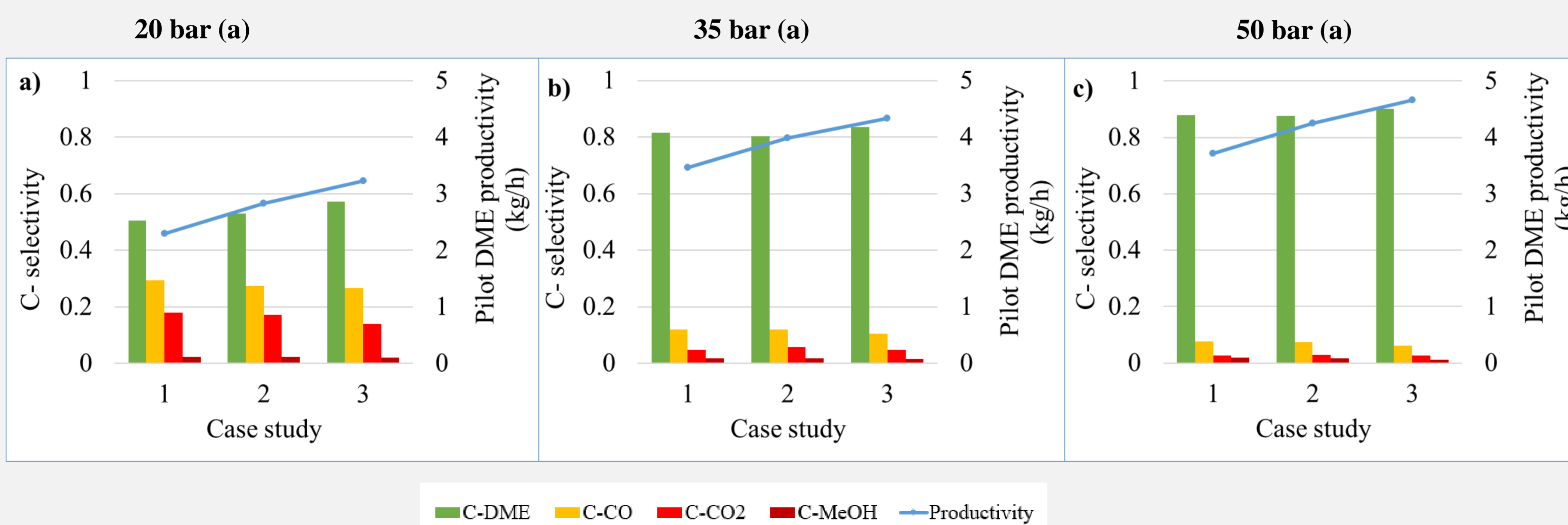


Case studies of this work

Three cases are compared with different CO_2/CO feedstock ratios yet a stoichiometric amount of hydrogen using a MATLAB one-dimensional dynamic reactor model

	Feed composition (mol.%)					
	H_2	CO	CO_2	H_2O	N_2	CH_4
Case 1	71.5	5.5	20.0	1.0	1.0	1.0
Case 2	68.8	17.7	11.1	0.6	0.9	0.9
Case 3	66.5	25.5	5.0	1.0	1.0	1.0

Main results in terms of C- selectivity and DME productivity



Towards TRL 7!



SEDMES PILOT PLANT

The process will be tested with real producer gas at TRL 7 in the framework of the BUTTERFLY project

STAY TUNED!

Highlights

- Higher CO content in feed increases productivity reaching 3.2 kgDME/h for 20 bar(a) and 4.7 kgDME/h at 50 bar(a) compared to CO-lean feed providing productivity of 2.2 kgDME/h at 20 bar(a) and 3.7 kgDME/h at 50 bar(a).
- The selectivity is not affected by variations in CO_2/CO in the feedstock in the optimal operating window.
- Increased pressure has beneficial impact on the productivity and selectivity reaching 50-60% at 20 bar(a) and 90% at 50 bar(a).
- The design study shows the flexibility of the SEDMES pilot unit to process variable feedstock under varying conditions, which provides an important basis for planned experimental demonstration tests.

Acknowledgements

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