Influence of variable CO/CO$_2$/H$_2$ synthesis gas in the direct DME synthesis


Experimental approach

Objectives

- Study of the role of CO$_2$ in the direct DME synthesis.
- Investigation of different MeOH-forming catalyst systems as well as dehydration components with regard to dynamic/various reaction conditions.
- Optimization of DME productivity by varying the ratio of active components for a selected catalyst system.
- Long-term stability investigation and deactivation studies under different operating conditions.

Conclusions

- Even at low CO$_2$/CO$_x$ feed ratios, the use of FER shows increased DME productivity compared to γ-Al$_2$O$_3$.
- The combination of CZZ/FER enables adaptation to dynamically changing compositions of the synthesis gas feed.
- In particular, at CO$_2$/CO$_x$ ratios between 0.4 and 0.8 high DME selectivities between 80 and 95 mol% can be realized.
- With FER, the DME production is not limited up to CZZ bed-volume fractions of 86 % (at constant bed volume).