

CARE-O-SENE: Fast-tracking Catalysis for Sustainable Aviation Fuel through Collaboration

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One promising approach to decarbonizing the hard-to-abate aviation sector, is the production of sustainable aviation fuels (SAF) via the Power-to-Liquids (PtL) process [1]. Cobalt-based Fischer-Tropsch catalysts are of significant interest for PtL applications due to their high selectivity for straight-chain paraffins and low CO₂ selectivity. However, challenges remain, particularly when using expensive renewable syngas, such as achieving high conversion rates (high water tolerance) and optimizing selectivity to the targeted molecules [2]. In the CARE-O-SENE project (established in 2022), we employ an integrated, cross-functional research approach to design, develop, and scale up innovative cobalt catalysts (Figure 1). Chemical promotion offers a key avenue to enhance selectivity, and here we illustrate how advanced in-situ characterization techniques, combined with theoretical modelling, can provide insights into the role of promoters. As part of our impact analysis, we conduct life cycle and techno-economic assessments to evaluate the catalysts' performance in these processes. Additionally, we showcase a risk-mitigated scale-up approach to produce catalysts at a tonne scale, followed by testing in a semi-commercial slurry reactor (300 b/d) that replicates commercial hydrodynamic conditions.



Figure 1: Outline of Work Packages (WP) in the BMBF-funded CARE-O-SENE program.

References

- [1] D. Moodley, et al in “*Catalysis for a Sustainable Environment* (Wiley)”, 2024
- [2] J. Potgieter, et al, *Catalysis Today* 432 (2024): 114554