

CHARACTERISATION OF FISCHER-TROPSCH CATALYSTS FOR GREEN FUEL PRODUCTION AT THE BESSY II SYNCHROTRON LIGHT SOURCE

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The CARE-O-SENE project connects seven major German and South African partners from industry and academia aiming at advancing the development of Co-based catalysts for green kerosene production via Fischer-Tropsch-Synthesis (FTS) ^[1,2].

Here, we showcase newly developed capabilities at the BESSY II synchrotron light source that enable multi-scale imaging and spectroscopic techniques for *in-system*, *in-situ*, and *operando* characterization of thin-film and powder FT catalysts. In CARE-O-SENE, we investigate model and commercial Co-based catalysts by X-ray diffraction (XRD), ambient pressure soft and hard X-ray photoelectron and absorption spectroscopies (AP-XPS, HAXPES, and XAS) as well as correlative synchrotron- and focused ion beam (FIB) tomography, enhanced by machine learning approaches to access detailed 3D data analysis of catalysts across micron-to-nano scales.

This holistic approach provides crucial insights into the surface and bulk structural, chemical, and electronic properties that govern the catalyst activity and selectivity. In the frame of Care-O-Sene, Sasol recently achieved kerosene yields over 80% that will accelerate the commercialisation of sustainable aviation fuels (SAF)^[1].

References

[1] <https://care-o-sene.com> (retrieved 25/02/2025);

[2] D. Moodley, T. Botha, R. Crous, J. Potgieter, J. Visagie, R. Walmsley, C. Dwyer. Catalysis for a Sustainable Environment, Eds. A.J.L. Pombeiro, M. Sutradhar, E.C.B.A Alegria (Wiley, 2024), Chapter 6, 73–116.