

A-163

Demonstration of an integrated power-to-liquid plant for SAF production using a 220 kW Co-SOEC module

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E-fuels are anticipated to play a significant role in the decarbonisation of sectors that are difficult or impractical to electrify, including aviation and maritime transport. Co-SOEC technology provides an energy-efficient pathway for producing the syngas required for synthesis processes such as Fischer–Tropsch conversion. However, the realisation of industry-relevant scale Co-SOEC-based PtL plants is necessary to validate the technological potential and assess its performance under practical operating conditions.

In this work, a Co-SOEC system was successfully integrated into a PtL plant employing Fischer–Tropsch synthesis. The 220 kW Co-SOEC module, developed by Sunfire, was coupled to a compressor and a flare, demonstrated highly reliable and stable syngas production, with straightforward tuning of the H₂/CO ratio and overall efficiency of 85%. The compressed syngas was directly utilised in the synthesis process, enabling the validation of the complete process chain and the production of syncrude. Furthermore, the recycling of Fischer–Tropsch off-gas back into the Co-SOEC was demonstrated, providing an efficient means of enhancing carbon utilisation and improving the overall system efficiency.



Co-SOEC module at KIT's PtX Lab