

Demonstration of modular production of CO₂-neutral liquid fuel

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The use of renewable electricity for the production of liquid synthetic fuels or chemical products is imperative if the emission of carbon dioxide needs to be reduced to 10% of the current amount and at the same time no losses in the availability of chemical products or the basic transport options are accepted. The efficiencies of the transformation, the closure of the CO₂ cycle and the emissions associated with the use of the highly valuable products play a decisive role in the neutrality with regard to possible greenhouse gas emissions.

For this reason the project partners Climeworks AG, Sunfire GmbH, INERATEC GmbH as well as KIT work together on the realization of a demonstration plant within the scope of the Kopernikus project Power-to-X, which combines the principle of a CO₂-capture from the air, the conversion of the CO₂ with water vapour in an innovative high temperature co-electrolysis process to a synthesis gas mixture of carbon monoxide and hydrogen, the subsequent synthesis of a liquid crude product in a Fischer-Tropsch synthesis and a direct treatment of the synthesis product to a liquid fuel crude product. If the CO₂ is derived from air and the electricity for the electrolysis is generated from a renewable source such as wind, sun or water power, this overall process concept provides a closed cycle of all greenhouse gases, at least for the synthesis process to the combustion of the recovered fuel to be almost 100 % neutral. The consideration of efforts for building the renewable power source, the synthesis plant, the supply chain as well as the automobile / aircraft may reduce the value down to 80 %. However, the latter influence is currently under study.

The scope of each partner development is set and Detail Engineering is to be completed until summer 2018. Installation of the complete process chain in a single container shall be accomplished in autumn 2018 at the location of KIT. The fuel samples are assessed for quality and superior combustion properties by the project partners DLR and Audi AG for aviation or automotive applications, respectively. Life cycle analysis of environmental impacts and costs for the overall process from manufacture of the plant up to the fuel use, i.e. from cradle to grave, is done in cooperation with KIT and Audi AG.

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