CE-SPIRE-02-2018

COZMOS

Full Title: Efficient CO2 conversion over multisite Zeolite-Metal nanocatalysts to fuels and OlefinS

Aim:

What if we were able to use CO_2 and H_2 from renewable energy sources as fuel and chemical feedstocks, and thus decrease CO_2 emissions and displace fossil fuels at the same time? COZMOS will develop an energy-efficient and environmentally and economically viable conversion of CO_2 to fuels and high added value chemicals via an innovative, cost effective catalyst, reactor and process. The concept will combine the sequential reactions of CO_2 hydrogenation to methanol and methanol to C_3 hydrocarbons, exploiting Le Chatelier's principle to overcome low equilibrium product yields of methanol. Complete conversion of CO_2 to a 85 % yield of C_3 hydrocarbons will be achieved by using an optimised bifunctional catalyst within a single reactor. The optimised catalyst will allow the combined reactions, that currently run at disparate temperatures and pressures, to operate in a temperature/pressure "sweet spot", which will reduce infrastructure and provide energy and production cost savings. The concept will allow tunable production of propane, an easily stored fuel used for heating, cooking and transportation, and the more valuable product propene, a base chemical primarily polymerised to lightweight plastics but also a starting point for a number of other industrially relevant chemicals, depending on location, amount of available renewable energy and economic needs. The integrated technology will be demonstrated at TRL5 on off-gases from the energy intensive steel and refinery industries. Markets for both propane and propene are expected to grow in the coming years, such that the COZMOS technology will contribute to achieving a Circular Economy and diversified economic base in carbon-intensive regions.

Throughout the whole value chain development, emphasis will be placed on risk-mitigation pathways and strong industrial involvement, LCA and techno-economic analysis to maximise further exploitation and industrialisation of the results. Specific attention will be paid to social acceptance, including analysis of stakeholder and end-user interests.

Start date:
01/05/2019

End date:
31/10/2023