MAY 2022

4AirCRAFT

4AirCRAFT combines hybrid catalytic conversion and process intensification to bring out an efficient, precise, flexible and scalable unique technology to direct convert recycled CO_2 into sustainable and clean liquid fuels, thus making flying carbon neutral.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 101022633. This work is supported by Japan Science and Technology Agency (JST) under Grant Agreement No JPMJSC2102. This project is developed in the frame of a Mission Innovation Challenge.

4AirCRAFT

Air Carbon Recycling for Aviation Fuel Technology

The 4AirCRAFT technology uses an innovative catalytic reactor to conduct the conversion in:

Product.
Precise synthesis and high yield of jet fuel

Integration.
Single cascade reactor

Mild conditions.
Unprecedented low temperature

Rational design.
Hybrid catalyst integration & synergetic approach

Disruptive technology.
Validated at lab scale

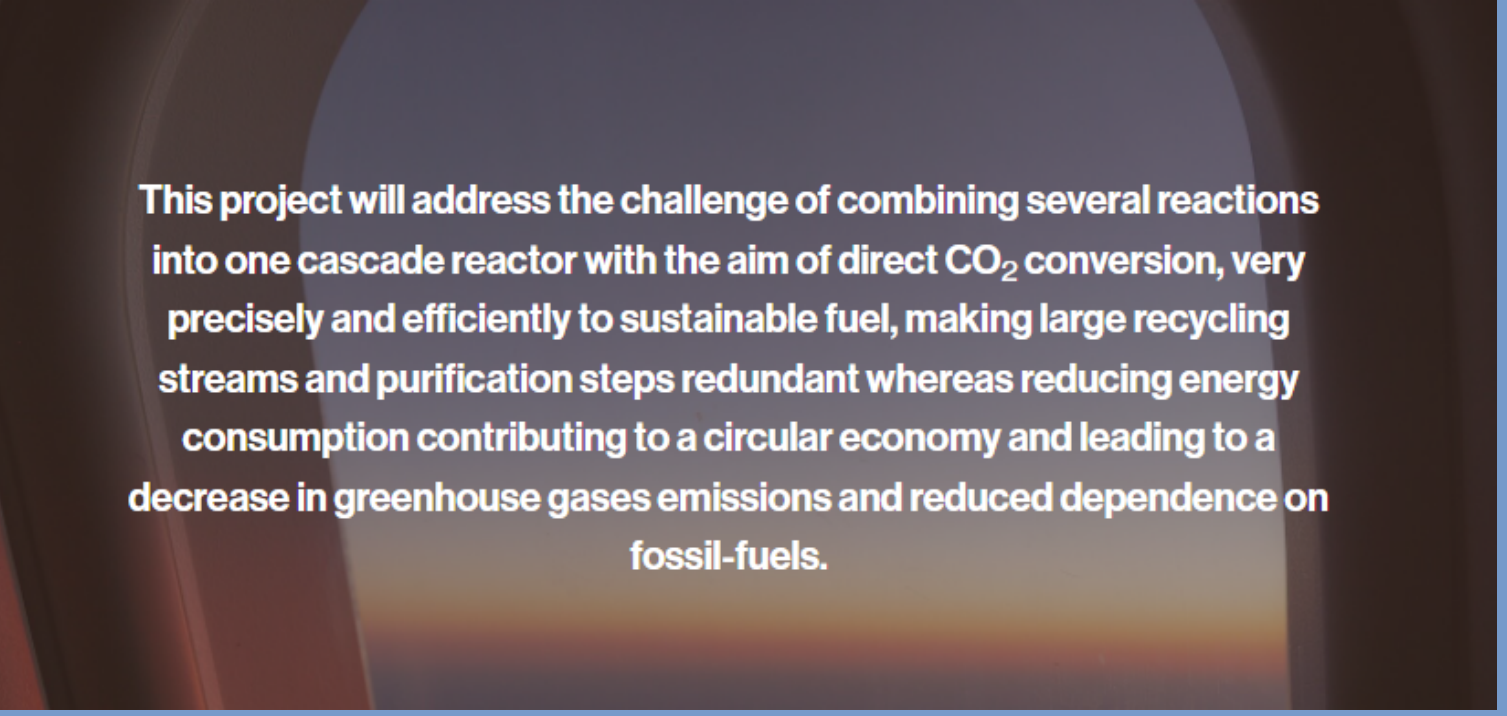
The development of low- or net-zero emission fuels is a crucial and urgent challenge to adress.

1 MOTIVATION AND CHALLENGE

The intensive exploitation of fossil fuels by mankind brought our ecosystem to the edge of a cliff. While their increasingly serious consequences on the global climate manifest year after year, we find ourselves challenged in a worldwide effort to curb anthropogenic greenhouse gas emissions and to accelerate the green transition of modern society to a more sustainable and circular economy.

2 CONCEPT AND APPROACH

The 4AirCRAFT "Air Carbon Recycling for Aviation Fuel Technology" will establish a game-changer reactor technology to produce synthetic kerosene more efficient and clean in comparison with existing approaches.
Synthetic kerosene will be produced from recycled CO_2 , green H_2 and renewable electricity to meet net-zero targets.



This project will address the challenge of combining several reactions into one cascade reactor with the aim of direct CO_2 conversion, very precisely and efficiently to sustainable fuel, making large recycling streams and purification steps redundant whereas reducing energy consumption contributing to a circular economy and leading to a decrease in greenhouse gases emissions and reduced dependence on fossil-fuels.

3 AMBITION AND OBJECTIVES

At the core of 4AirCRAFT innovation is the synergetic combination of tuned electro-, chemo- and bio-catalysts and their controlled spatial distribution within application tuned catalyst carrier structures.

This will enhance the activity of catalytic phases and materials allowing high CO_2 conversion rates and selectivity towards jet fuels (C_{8-16}). The unique process requires much less energy, potentially reducing the cost of sustainable fuel for the aviation sector.

4AirCRAFT will develop and proof (TRL3) a flexible, energy-efficient, environmentally friendly, economically viable, and socially affordable reactor technology for the production of clean and sustainable fuel.
The unique reactor technology will convert precisely and efficiently CO_2 into C_8-C_{16} hydrocarbons.

PHASE 1.

NEXT-GENERATION CATALYST

Rational design of catalyst/porous carriers. Structural, mechanistic investigations and kinetics in terms of CO_2 conversion and C_8-C_{16} selectivity.

PHASE 2.

MICRO-STRUCTURED REACTOR

Design and manufacturing of hierarchical reactor.

CFD simulation.

PHASE 3.

PROOF-OF-CONCEPT

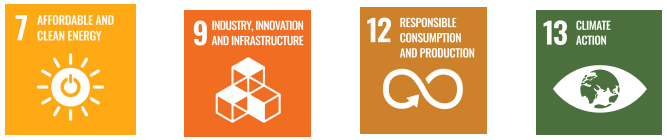
Lab-scale experimental proof of concept, process conditions and environmental assessment.

All of this will be achieved by reducing the energy consumption and temperature while boosting integration degree by direct conversion in a compact sized single cascade reactor.

4 IMPACT

4AirCRAFT aspires to obtain a new technology capable of producing sustainable high-density fuels, from waste and renewable feedstocks and sources. For this purpose, it is developed a single cascade reactor based on the synergestic combination of different reactions, without the need to add any purification step.

This project addresses the European Green Deal as well as the 2030 Agenda for Sustainable DevelopmentGoals (SDGs)



It indirectly contributes also to:

EXPECTED RESULTS

An increase in the conversion of CO_2 compared to conventional technologies.

Enhancing the catalytic activity and stability.

Minimization of the production of shorter chain hydrocarbons.

High-selectivity for obtaining long chain hydrocarbons.

UPCOMING EVENTS

4AIRCRAFT WILL BE PRESENT AT WORLD HYDROGEN ENERGY CONFERENCE, EUROPEAN HYDROGEN ENERGY CONFERENCE, WORLD HYDROGEN TECHNOLOGICAL CONVENTION, ETC...

Spring 2023 - Workshop

Tentative topics:

- Rational design and manufacturing of catalytic materials for sustainable synthesis of high-density hydrocarbons.
- Synthesis of catalysts for more sustainable transformations, their performances, structure-properties relations, and catalytic modelling.

Spring 2024 - Workshop

Tentative topics:

- Catalyst.
- Jet Fuel synthesis
- CO_2 conversion.
- Alternative fuels.

Stay tuned to our website!

4AirCRAFT

Air Carbon Recycling for Aviation Fuel Technology

CONSORTIUM

We believe that the success of our project will enable a paradigm-shift in the field of alternative renewable fuels, where the 4AirCRAFT technology will allow lower costs and pollution, while leading to a positive economic and environmental impact worldwide.

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