HIGFLY

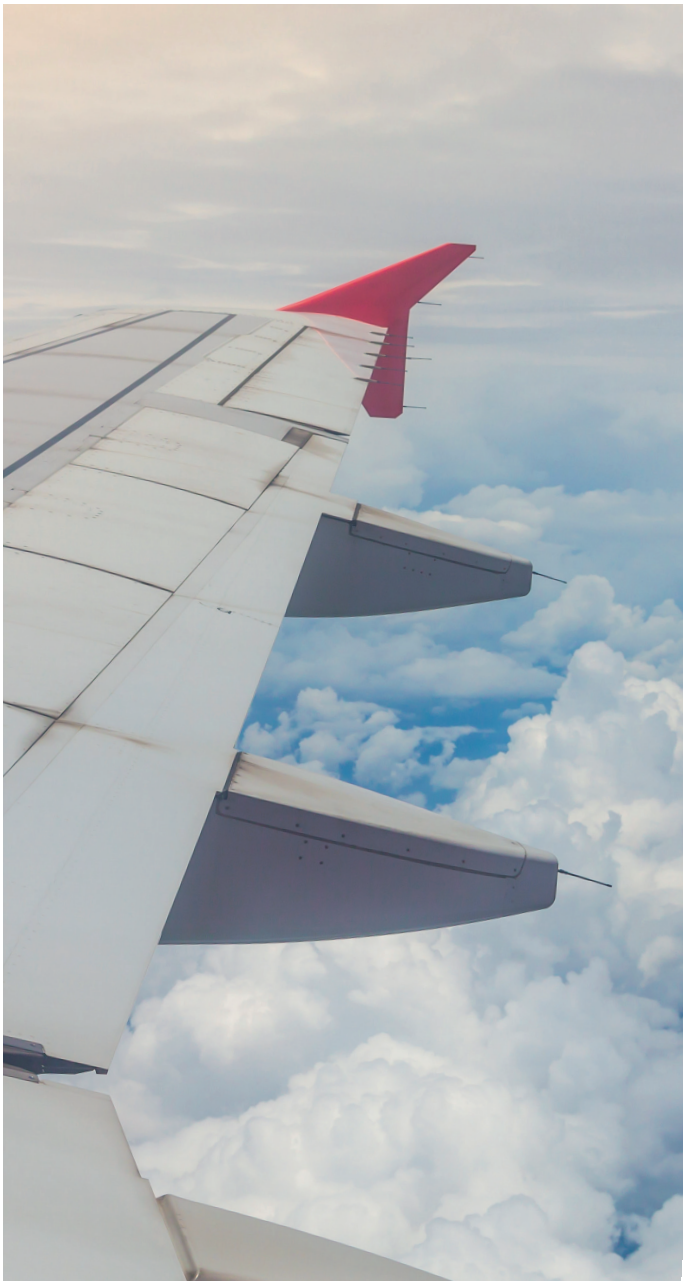
HIGEE TO FURANIC-BASED JET-FUEL TECHNOLOGY

Newsletter 1

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006618
The present publication reflects only the author's views and the European Union is not liable for any use that may be made of the information contained therein.

THE HIGFLY PROJECT

The main aim of the HIGFLY project is to develop sustainable aviation fuels from abundant second-generation feedstock in order to mitigate the environmental impact of aviation.
HIGFLY plans to achieve this by targeting sustainable feeds, maximising resource efficiency, minimising energy demands, increasing process scalability and minimising environmental impact, while also decreasing the cost and accelerating the uptake of bio-based sustainable aviation fuels, increasing their share in the EU market.
Specifically, the HIGFLY project will develop and demonstrate, at TRL3–4, novel reactor and separation technologies and a robust and continuous catalytic process to produce and purify jet fuel precursors from C5 biorefinery streams with 80–90% carbon efficiency; and will also evaluate catalytic routes to valorise light oxygenates present in aqueous side-streams to produce hydrocarbons and hydrogen. The suitability of HIGFLY's sustainable aviation fuel will be assessed along with the sustainability, environmental and social impacts of the production process by evaluating abundant and sustainable feedstocks and conducting techno-economic and life cycle assessments of the entire value chain, from feedstock to bio jet fuel.



The main achievements of the HIGFLY project to date are the following:

- 35 new catalyst materials have been synthesised, characterised and tested, with two being identified as highly attractive.
- New, sustainable solvents have been discovered via AI-based modelling using quantum mechanical data, with an estimated 5–10 times greater performance than conventional solvents.
- Catalysts have been formed into pellets and extrudates for testing in the HiGee reactor and have shown to be both scalable and highly efficient.
- New reactors based on HiGee technology that show enormous potential for process intensification due to higher mass and heat transfer rates over other conventional reactors. Results from experiments and modelling show a potential 50-fold decrease in reactor size with an increased yield of up to 90% compared to the technology currently available; and a significant reduction in the amount of humins, which allows for continuous operation and, therefore, a reduction in capital expenditures to produce furfural.
- Ongoing development of catalytic structures and processes for the conversion of C5 biorefinery streams to furfural and bio-oxygenates and the subsequent condensation of side-streams following their dehydration.

PROJECT PROGRESS

Solid acid catalysts for producing furfural from biomass

Furfural is a valuable chemical that can be produced from biomass and is commonly used as a building block in the synthesis of various chemicals such as solvents and pharmaceuticals. However, the production of furfural from biomass-derived sugars becomes challenging due to the complexity of the feedstocks and the low selectivity of the process, where sub-products are largely formed. One possible solution to overcome this challenge is the use of solid acid catalysts.

READ MORE

Catalytic process design for the condensation of furfural and bio-oxygenates

The condensation of furfural and bio-based oxygenates is an important aspect of the HIGFLY process as it has the potential to produce value-added chemicals and fuels from products following the dehydration of hemicellulose (C5) sugars.

READ MORE

The development of 3D foam catalytic structures

Structured catalysts and reactors have become one of the most important and commercially significant applications of reactor engineering and industrial catalysis. They can help to efficiently process large fluid flows with minimal pressure drop and can reduce hot/cold spots in reactors caused by issues such as uneven heating and cooling, poor mixing, catalyst deactivation and limitations in mass transfer rates.

READ MORE

RELATED NEWS & UPDATES

SkyNRG´s Sustainable Aviation Fuel Market Outlook

The HIGFLY project aims to accelerate the commercialisation of sustainable aviation fuel (SAF) and increase its share in the EU market by improving the cost effectiveness and energy efficiency of obtaining hydrocarbons in the kerosene range from abundant, sustainable feedstocks.
HIGFLY partner SkyNRG is a global leader in the SAF market with a mission to build SAF capacity to meet the aviation sector´s 2050 net zero commitments.

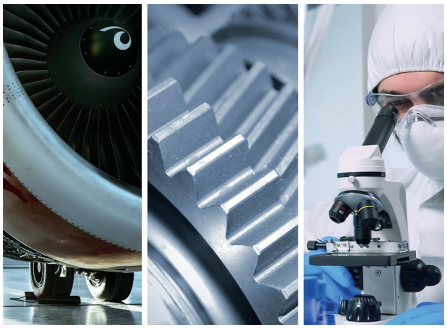
READ MORE

Miscanthus as a possible feedstock for the HIGFLY process

HIGFLY researchers are aiming to make their technologies flexible enough to efficiently process a variety of feedstocks to mitigate any potential supply chain issues and ensure that the technologies remain relevant in the face of changing agricultural, biological residue and biorefinery landscapes.

READ MORE

HIGFLY´s potential contribution across multiple sectors



Although the current innovations proposed in HIGFLY are most relevant to the aviation fuel sector, the technologies and materials being developed can also contribute to other sectors and be adapted to produce an array of products supplying precursors and ingredients for the bio-chemical, pharmaceutical and bio-plastic industries to name but a few.

READ MORE

RELATED PROJECT

Glycerol to aviation and marine products with sustainable recycling

The GLAMOUR project aims to develop a process that converts waste bio-based feedstock such as crude glycerol into aviation and marine diesel fuels. The project involves high pressure, auto-thermal reforming/gasification using chemical looping to produce syngas and the integration of a Fischer-Tropsch compact reactor using a 3D printed structured catalyst.

READ MORE

EVENTS

EUBCE 2023

HIGFLY researchers from TNO gave 2 presentations at this year´s European Biomass Conference & Exhibition – EUBCE 2023, held in Bolgna, Italy.The two presentations were:

Stefania Luzzi
TNO

Design and Evaluation of a Process for Bio-advanced Saf Hydrocarbons from Biorefinery Streams Via Furfural and Ketones

READ MORE

Karla Dussan Rojas
TNO

Catalytic Condensation of Biobased Molecules for Jet Fuel Synthesis

READ MORE

EUROPACAT 2023

Researchers from HIGFLY partner CSCI-ITQ will be presenting at the 15th European Congress on Catalysis – EUROPACAT 2023 in Prague, Czech Republic from August 27th – September 1st.
The congress will attract industrial participants from businesses with a focus on catalyst development and production, refining and petrochemistry, fine chemicals and pharmaceuticals synthesis, energy conversion including use of renewable resources, car manufacturing, new materials, gas and water cleaning, abatement of emissions from stationary and mobile sources.
And academics who focus on catalysis, reaction engineering, chemical engineering, material science, analytical chemistry, electrochemistry, photocatalysis, organic and inorganic chemistry, physical chemistry, and computational chemistry.
To find out more about EUROPACAT 2023, visit their website at: *europacat2023.cz*

PROJECT VIDEO

The HIGFLY HiGee Reactor: An Interview with Dr Fernanda Neira D´Angelo

Dr Fernanda Neira D´Angelo is the HIGFLY Project Coordinator and a tenured Assistant Professor at Eindhoven University of Technology. In this video, Doctor D´Angelo provides an insight into the technological development being conducted at TU/e, specifically, the HIGFLY HiGee reactor which will be used to improve the production process of biobased jet fuel.

WATCH THE VIDEO

COMING UP IN THE NEXT EDITION!

In the next edition of the HIGFLY newsletter we will provide more updates on the project´s progress with articles on the development of deep eutectic solvents for the synthesis of furfural and bio-oxygenates, HiGee reactor development, a catalytic process for the hydrodeoxygenation of condensed intermediates, and the techno-economic evaluation of the HIGFLY process.

There will also be a featured related project, sustainable aviation fuel sector news, event information...

and much more!

HIGFLY

TU/e

TNO innovation for life

SKYNRG

INSTITUTO DE TECNOLOGÍA QUÍMICA

Fraunhofer UMSICHT

JM Johnson Matthey Inspiring science, enhancing life

ifeu INSTITUTE FOR ENERGY AND ENVIRONMENTAL RESEARCH HEIDELBERG

Kneia

BOEING

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006618
The present publication reflects only the author's views and the European Union is not liable for any use that may be made of the information contained therein.