GLAMOUR

GLycerol to Aviation and Marine prOducts with sUstainable Recycling

PROJECT

The objective of the GLAMOUR project is the design, scale-up and validation of an integrated process that converts the waste bio-based feedstock such as crude glycerol into aviation and marine diesel fuels. The focus of the project will be a combination of high pressure, auto-thermal reforming/gasification using chemical looping to produce syngas and the integration of Fischer-Tropsch compact reactor integrated with 3D printed structured catalyst. The GLAMOUR process will achieve full conversion of the crude glycerol into syncrude which is later upgraded to synthetic paraffine kerosene (FT-SPK) to be used as jetfuel and into marine diesel oil (MDO) with an energy efficiency of 65%. These improvements would increase the overall revenue of existing 2nd generation bio-diesel plants reducing the cost for large scale biomass-to-liquid production processes up to 35% and the CO2 emissions up to 70%. The project will focus on the scale up of the two processes to achieve a final TRL5 demonstration for 1000 hours by using 2 kg/h of glycerol in a packed bed chemical looping system and a downstream FT reactor.

OBJECTIVES

- To develop, test and scale-up new catalyst formulations for chemical and calcium looping reforming
- To select, test and scale-up a new 3D-printed structured catalyst for FT synthesis
- To integrate and demonstrate the glycerol-to-syngas conversion and fuel synthesis in a single process prototype at TRL5 after 1000 hrs of operation
- To perform the overall techno-economic analysis and optimisation of the process for full scale applications
- To assess the overall economics of the process
- To implement the business plan of the GLAMOUR process of the entire value chain
- To improve the social sustainability of bio-fuels and inform policy makers

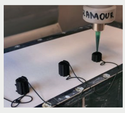
PROJECT PROGRESSES & UPDATES

During the first year of research and development, GLAMOUR has already reached some interesting results. Argent Energy has made significant progress in the purification of glycerol. Tests of different glycerol feedstocks were conducted at the University of Manchester and progresses were made in improving quality with a simple purification step. Current technologies to produce liquid synthetic fuels on an industrial scale has been reviewed by Siirtec Nigi and Gas to Fischer-Trospsch liquid (GTL-FT) was chosen as a commercial benchmark. C&CS is developing Ni-based reforming catalysts with compositions and surface properties tailored to the intended application conditions. An initial sample has been sent for catalytic activity testing at CSIC, showing promising results in initial glycerol reforming tests. TNO, together with TU/e, VITO, INERATEC, C&CS, is developing a tailor-made (3D printed) Fischer-Tropsch (FT) catalyst. TU/e started with modelling and created a first FT-2D model, which represents a starting point to study a variety of geometries and optimise heat management within the structure. INERATEC has performed the testing on stat-of-the-art FT reactor to benchmark the performance with different syngas composition. In parallel, VITO started with the first 3D prints using commercial catalyst powder and using bi-functional catalysts prepared by TNO. CiaoTech is focusing both on the identification of stakeholder and market and technology trends for a successful exploitation of the project results and on the dissemination of the GLAMOUR progresses.

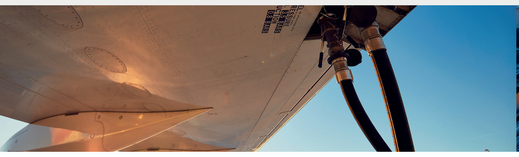
Reactor used for chemical looping reforming of methane

Gas feeding system

Gas-solid reaction lab at the University of Manchester



First 3D printed GLAMOUR catalysts produced by VITO



CONSORTIUM

The GLAMOUR Consortium comprises 10 partners from 6 countries with strong multidisciplinary competences required for carrying out the work plan and match project objectives.

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