Triacylglycerides to marine and jet biofuel via hydrotreating

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Keywords: Biofuels, hydrotreatment, marine biofuel, Jet biofuel, Triacylglycerides

Introduction.
The global aviation industry seems to be a constantly and rapidly expanding sector in recent years. The International Air Transport Association (IATA) claims that the request for air connectivity will continue to grow. In addition in April 2018, IMO's Marine Environment Protection Committee (MEPC) adopted an initial strategy on the reduction of greenhouse gas emissions from ships.The major challenge for thermochemical pathways is to develop conversion technologies with reduced energy consumption. In this direction, it is critical the incorporation of alternate approaches aiming to supply the demanding energy requirements of gasification process, syngas production, purification, hydrocracking etc. [1]. The BioSFerA concept aims to develop a combined thermochemical - biochemical pathway that minimizes the shortcomings of the existing technologies and takes advantage of their strong aspects in order to produce elevated yields of the desired fuels with limited energy consumption[2].

Experimental/methodology.
The overall process, combining thermochemical, biological and thermocatalytic parts is based on the gasification of biomass and other biogenic waste in a Dual Fluidized Bed gasifier and the 2-stage fermentation of the produced syngas. Through this process the syngas is converted to acetate (1st stage) and then the acetate is converted to TAGs (2nd stage). The produced TAGs contained medium and long fatty acids were hydrotreated and isomerized after the necessary separation and purification and the end-products are jet- and bunker-like biofuels, respectively. The current manuscript, will present the step of TAGs upgrading via hydroprocessing targeting jet- and bunker-like biofuels.

Results and discussion.
The results have shown that the most influential parameter during hydrotreatment, is the reaction temperature that strongly affects the mass recovery curve of the product. In general, higher reaction temperatures favour hydrocracking reactions leading to lighter hydrocarbons in jet fuel range. On the other hand, lower hydrotreating temperature leads to heavier hydrocarbons in bunker fuel range. Thus, the choice of reaction temperature is very important as it affects the final distillation range and thus the bunker fuel and jet fuel yields of the product. Pressure is also influencing the hydrotreating reactions and more specifically, the higher the pressure the lighter the product is. However, the effect of pressure is not as strong as that of temperature. Furthermore, as higher pressures and temperatures favour hydrocracking reactions, this result in higher hydrogen consumption. The hydrogen consumption increased as the heavier hydrocarbons are cracking to lighter ones. Thus, the choice of the optimum operating parameters is very important and depends first of all from the targeted products (bunker or jet range biofuels) and also from the optimum hydrogen consumption.

Acknowledgments
The current work has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 884208. Project name "BioSFera" (Biofuels production from Syngas FERmentation for Aviation and maritime use)

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