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Validating alternative technological pathways of bio-oil refinery integration: co-hydrotreatment

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PURPOSE OF THE ABSTRACT

The current strategic framework for a Resilient Energy Europe, having set ambitious 2020 and 2030 energy and climate targets, calls for energy security, a decarbonized economy and a fully-integrated and competitive European energy market. Toward this direction the European Industrial Bioenergy Initiative (EIBI), launched under the Strategic Energy Technology (SET) Plan, prioritized pyrolysis technology among the most promising ones. Therefore, international research is being conducted on developing and further validating strategies and innovative technological pathways that will overcome techno-economic limitations associated with the valorisation of pyrolysis bio-oil, as an alternative and renewable transport fuel. In this respect, pyrolysis bio-oil refinery integration appears to be of great perspective. The study is part of

BioMates Horizon2020 research and innovation EU project, aspiring in combining innovative 2nd generation biomass conversion technologies for the cost-effective production of reliable bio-based intermediates that can be further upgraded in existing oil refineries as renewable and reliable co-feedstocks.

The main premise of this study is to overcome the key technological challenges of co-processing refinery intermediates with the newly developed bio-based intermediates, i.e. hydrotreated pyrolysis bio-oils (BioMates). In this frame, the homogeneity of the two types of feedstocks is initially conducted via a miscibility study, as a pre-screening step of the candidate refinery intermediate for the co- hydroprocessing study that will follow. Among the candidate refinery streams, Light Cycle Oil (LCO), which is the product of the Fluid Catalytic Cracking (FCC) unit, was identified as the most compatible feedstock (Figure 1), which is conventionally subjected to hydrotreatment (HDT) in order to reduce its sulphur levels and to saturate aromatics thus increasing its cetane number [1]. The present study particularly investigates the compatibility of LCO with BioMates towards downstream co-hydroprocessing, intended within existing petroleum crude oil refineries. Co-hydrotreatment of the referenced mixture of BioMates and LCO is furthermore investigated in a continuous hydroprocessing pilot-plant, following a detailed multi-parameter hydrotreatment testing protocol that targets to formulate the optimal operating window (e.g. temperature, H2 partial pressure).

FIGURES

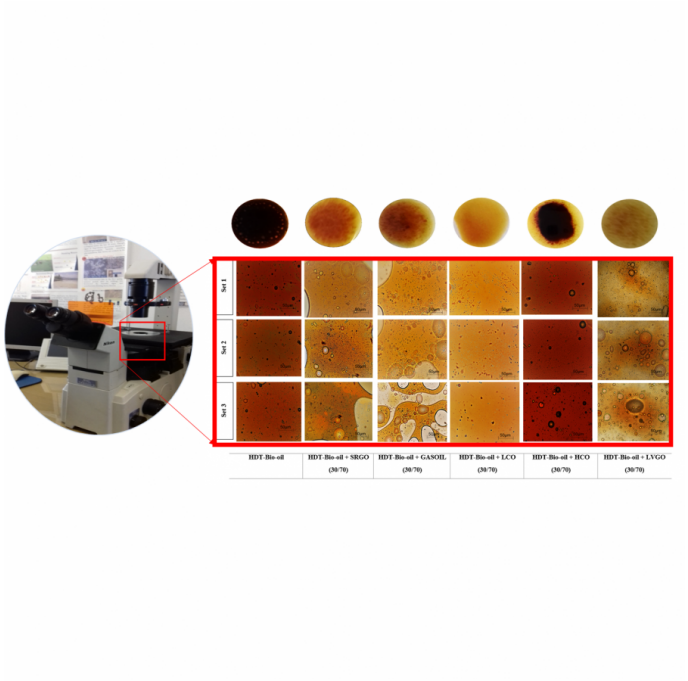

FIGURE 1

Figure 1

Microscope analysis images of HDT-Bio-oil, selected petroleum fractions and their (30/70) mixture, respectively (magnification level for light microscopy images: 20; camera's magnification: 10)

FIGURE 2

KEYWORDS

Bio-oil | refinery integration | refinery intermediates | co-hydrotreatment

BIBLIOGRAPHY

[1] Manara, P., Bezergianni, S., Pfisterer, U., Energy Conversion and Management, 2018, 165, 304–315.