Alternative feedstock for the production of 2nd generation biodiesel: the case of Greece

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Abstract:
Biodiesel is an important alternative renewable fuel as it is environmentally friendly, non-toxic, and has lower emission gases when used for combustion. However, the high cost of feedstock for biodiesel production remains a barrier to its further widespread use. To this add the significant production of by-products (soapstock, fatty acids, glycerine) that affect its final market price. Therefore, the development of novel processes that may integrate alternative feedstock sources and the proper valorisation of its by-products towards valuable chemicals are of paramount importance for the current and future sustainable production of biodiesel (Canakci and Sanli, 2008).
The project ProperDiesel aims to the improvement of biodiesel production sustainability via the development of a value chain the includes the recycling and valorisation of liquid waste from the vegetable oil refining industry (soapstock and fatty acids) via chemocatalytic processes and the up-grading of the biodiesel by-product glycerine for the synthesis of high added value products (propylene). Soapstock is obtained as a by-product of the chemical neutralization of oils and fats with strong alkalies. A typical composition of soapstock is analysed to water 35-67% wt., fatty acids 10-28% wt., glycerides 12-13% wt., and phospholipids 5-9%wt (Echim et al., 2009). Routine processing of soapstocks includes their acidification with strong acids like sulphuric or hydrochloric acid, in order to split and recover the fatty acids as a fraction called oleins. Oleins could be used as an alternative feedstock for the production of biodiesel. Furthermore, glycerine is produced during the transesterification of glycerides towards methylesters, corresponding to an amount around 10% of the biodiesel produced. The purity of glycerine is directly correlated with its market value and possible uses (Ciriminna et al., 2014; Kong et al., 2016).
In view of assessing the potential of using soapstock and glycerine as alternative biodiesel feedstock or as feedstock for the synthesis of high-added value chemicals respectively, a primary goal of the project was the identification of the available quantities of soapstock, fatty acids and glycerine resulting from the vegetable oil processing and biodiesel plants operating in Greece.
The study conducted indicated that at the moment are operating in Greece 9 oil processing facilities applying chemical refining, thereby producing soapstock and fatty acids as side-products, while there are additionally 13 bio-diesel plants producing fatty acids and glycerine as side-products. Overall, the oil processing facilities produce 9000tn of soapstock and 4000tn of fatty acids. Additional 1400tn of fatty acids are produced during the synthesis of fatty acids methyl esters. On the other hand, based on the total annual production of biodiesel, the available quantity of glycerine amounts to 13000tn per year.

Keywords: soapstock, fatty acids, glycerine, biodiesel, vegetable oils

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