

## **Biodiesel Production from Olive Oil Industry Raw Materials**

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Biodiesel, a product obtained by transformation of glycerides in methyl esters, is an alternative fuel for diesel engines that can be used as a substitute or in mixture with diesel due to the similarity of their physical and fuel properties. The environmental benefits associated to its utilisation include a decrease in carbon monoxide, hydrocarbons, particles and SO<sub>x</sub> emissions. Another important feature is the positive balance of carbon dioxide emissions. The benefits are more pronounced as higher the biofuel percentage in the blend.

In Portugal, the raw materials traditionally used for biodiesel production (rapeseed, sunflower and soybean) are scarce comparatively to other European countries and also compete with food cultures. At the present, almost all the biodiesel produced in the country (~ 125 000 ton/year) derives from imported oleaginous seeds. In order to change this situation, it is mandatory to evaluate all the agricultural alternatives and also to consider the use of residues, such as used frying oil or animal fat, and other materials with a high glyceride content (ex: algae, low quality products from olive oil industry).

In this work, raw materials from the olive oil industry, lampant olive and olive husk oils, were studied in order to evaluate their potential for biodiesel production. Both were characterised in terms of parameters that influence the transesterification reaction and also the quality of the final product. The high acid value of the lampant olive oil (7 mg KOH/g) and the olive husk oil (22 mg KOH/g) indicates that the traditional process of basic catalysis is not suitable for the transesterification of these raw materials. So, a first step of acidic catalysis was introduced to reduce the free fatty acid content to a level lower than 2 mg KOH/g. This process was optimised, using factorial design and response surface methodology, in terms of initial catalyst concentration, reaction time and temperature. A subsequent step of basic catalysis was then applied (methanol:oil molar ratio of 6:1, 55°C and 500rpm). The final products obtained from lampant olive and olive husk oils were purified and characterised according to the specifications of EN 14214. In both cases a good quality biodiesel was obtained.