Production Of Biodiesel From Vegetable Oils Using Supercritical Alcohols

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Biodiesel is a clean-burning alternative fuel, produced from domestic renewable resources. It is made through a chemical reaction between alcohol and vegetable oils called transesterification. Biodiesel is better for the environment because it is made from renewable resources and has lower emissions compared to petroleum diesel. Generally speaking, there are two methods of producing a transesterification reaction. One is a process which uses a catalyst and the other is without a catalyst. However, there are at least two problems associated with the first (catalyst-using) process. It is relatively time consuming and purification at the end of the reaction is necessary to separate the product from the catalyst and the unwanted saponified compounds produced. The latter method involves uncatalyzed transesterification of vegetable oil in supercritical methanol.

The aim of this work is to determine the optimum reaction conditions needed to obtain vegetable oil methyl esters using the uncatalyzed supercritical methanol transesterification reaction. Sunflower and rapeseed oils are used as the vegetable oils in the analysis. Transesterification of vegetable oils was conducted using different quantities of oil and alcohol and different reaction temperatures. The optimum reaction conditions were 350 °C and a molar ratio of oil to alcohol of 1:42. Methyl ester contents and production yields of biodiesel obtained from sunflower and rapeseed oil were determined using gas chromatography-mass spectrometry (GC-MS). Without using a catalyst, the reaction was found to be completed in a very short time (within 2-30 min). In addition, as it is a non-catalytic process, the purification of products after the transesterification reaction is much simpler and more environmentally friendly.