

Comparative Study for Biodiesel Production Using a Batch and a Semi-Continuous Flow Reactor

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Abstract : Biodiesel may be produced through transesterification reaction (or alcoholysis), that is the transformation of a long chain fatty acid in an alkyl ester. This reaction can occur in the presence of acid catalysts, alkali, or enzyme. Currently, for industrial processes, biodiesel is produced by alkaline route. The alkali most commonly used in these processes is hydroxides and methoxides of sodium and potassium. In this work, biodiesel production was conducted in two different systems. The first consisted of a batch reactor operating with a traditional washing system and the second consisted of a semi-continuous flow reactor operating with a membrane separation system. Potassium hydroxides was used as catalyst at a concentration of 1% by weight, the molar ratio oil/alcohol was 1/9 and temperature of 55 °C. Tests were performed using soybeans and palm oil and the ester conversion results were compared for both systems. It can be seen that the results for both oils are similar when using the batch reactor or the semi-continuous flow reactor. The use of the semi-continuous flow reactor allows the removal of the formed products. Thus, in the case of a reversible reaction, with the removal of reaction products, the concentration of the reagents becomes higher and the equilibrium reaction is shifted towards the formation of more products. The higher conversion to ester with soybean and palm oil using the batch reactor was approximately 98%. In contrast, it was observed a conversion of 99% when using the same operating condition on a semi-continuous flow reactor.

Keywords : biodiesel, batch reactor, semi-continuous flow reactor, transesterification

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