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"The Role of Chemistry for Life Sustainability from Basic to Applied Research"

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The Role of Chemistry for Life Sustainability
"From Basic to Applied Research"

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Synthesis Of Biodiesel From Waste Cooking Oil By Two Steps Process Transesterification And Ozonation

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ABSTRACT

The synthesis of biodiesel has been widely studied. There are many raw materials used for the synthesis either from edible or non-edible oil. In this study, we investigated the synthesis of biodiesel using two steps process. The synthesis at 60°C and ozonation are running in consecutive ways. The waste cooking oil was prepared for synthesis at 60°C for one hour. The mol ratio of waste cooking oil and methanol was 1 : 5 and 1.5 % w/w NaOH was used as catalyst. The reaction involved in the synthesis is transesterification, the product was collected and then will be processed for ozonation. The ozonation was carried out at 20°C for 2 hours with mol ratio of methanol to transesterification product was 7 : 1. The acid catalyst (H_2SO_4) was used for 1.5 % w/w and 2 % w/w. Sample from both synthesis at 60°C and ozonation process have been analysed using Gas Chromatography. The composition of fatty acids (% w/w) in waste cooking oil used for the experiment were : lauric acid 0.34 % ; myristate acid 1.32 % ; palmitic acid 38.7 %, stearic acid 4.67 %, oleic acid 40.1 %, linoleic acid 12.7 % and others 2.17 %. It has been proved that transesterification product from synthesis at 60°C contained of long chain methyl esters, hence the reaction is esterification from long chain fatty acids to long chain methyl esters which consisted of saturated and unsaturated methyl esters. The dominants long chain methyl esters from synthesis at 60°C were methyl palmitate, methyl oleat, methyl stearate. Other long chain methyl esters are Methyl laurate, Methyl myristate, Methyl pentadecanoate, Methyl palmitoleate, Methyl linoleate, Methyl heneicosanoate, and Methyl heptadecanoate. There were three unsaturated methyl esters have been produced which are methyl palmitoleate, methyl oleat and methyl linoleate. All these products were then ozonised by ozonation process at various temperature. Short chain methyl esters which were from cracking of unsaturated methyl esters and long chain methyl esters remained as product . The transesterification can occur though it is only running at 10, 20 and 30°C. The short chain methyl esters are methyl nonanoate, methyl hexanoate, methyl hepatnoate and methyl octanoate. Methyl nonanoate was a product from cracking of methyl oleate, whereas methyl hexanoate was a product of cracking of methyl linoleate. It was found that the best temperature used for ozonation was 20°C.

Keywords: transesterification, ozonolysis, long chain methyl esters, short chain methyl esters, two steps process.