Catalytic decarboxylation of rubber seed oil to produce hydrocarbons

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The rising of fuel prices and the contribution of fossil fuels towards global warming have been major global concerns during past few decades. Interest in renewable fuels has increased due to the above mentioned problems. Green Diesel (GD) has emerged as a promising solution to these issues. The objective of this research is to derive hydrocarbons from rubber seed oil. Rubber seeds are considered as a waste in our country. Therefore, oil of rubber seeds is a potential fatty acid source for GD production.

Rubber seed oil was extracted using soxhelet method. Only a part of the exracted oil was hydrolyzed. Decarboxylation of both hydrolyzed, and non hydrolyzed oil were carried out in a especially designed glass apparatus with sodalime and alumina mixtures.The proportions of sodalime and alumina were varied in the catalyst mixture. Five non-hydrolyzed and three hydrolyzed samples were decarboxylated. The products were analyzed by GC-MS.

The hydrocarbons in the range of C-11 to C-16 carbon chain length have been produced during the decarboxylation process. However, unsaturated hydrocarbons were observed, as rubber seed oil mainly consist of unsaturated fatty acids such as linoleic acid. Percentage peak area can be taken as an indicator to quantitatively compare the hydrocarbons.The highest percentage peak are of 57.61% was shown by 6-Dodecene, which was present in the non- hydrolyzed sample where 25% alumina was added. Apart from that, 5-Undecene (19.90% peak area) and Tridecane(12.03% peak area) showed their presence in the non-hydrolyzed decarboxylated samples.

Hydrolyzed oil samples showed the presence of Tetradecane (4.46%), 2-Tetradecene (6.48%), 1-Hexadecene (0.41%),5-Tetradecene(2.39%), Pentadecane (7.90%) and 6-Tetradecyne(0.30%) which were not present in non-hydrolyzed samples.

It can be seen that with the addition of alumina to the catalyst system, that there is an increase in the percentage peak area. These experiments indicate that decarboxylation of rubber seed oil in the presence of sodalime and alumina can be employed to produce hydrocarbons in the diesel range which is of C-10 to C-28 chain length. Future studies will be conducted to optimize pressure and temperature conditions based on these findings.

Key words: Catalytic, Decarboxylation, Hydrocarbons,Rubber seeds