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OPTIMIZATION OF PROCESS PARAMETER IN CATALYTIC TRANSESTERIFICATION OF BIODIESEL PRODUCTION: A COMPARATIVE STUDY

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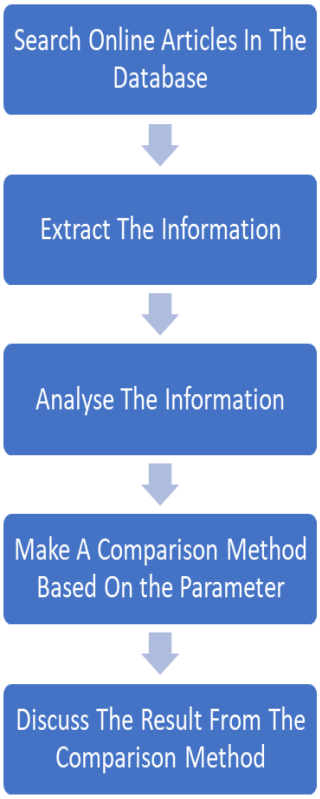
Abstract:
Biodiesel is a low emission diesel substitute fuel made from renewable resources. The most common ways to produce biodiesel is by using transesterification process. The process of transesterification with the reaction of triglyceride and methanol to form the biodiesel with the aid of catalysts. The aim of this review paper is to compare the optimize reaction conditions in biodiesel production for various feedstocks and to compare the optimize of biodiesel production by using different mixed oxide catalysts. The feedstocks use in this review paper is be differentiate by two types which are edible and non-edible oil hence the comparison with biodiesel will be conducted. For the second objectives, the heterogenous catalysts are used because of their advantages that can be reused, non-corrosive and non- toxic. The heterogenous catalysts contain of two different types which are mixed oxide and mixed metal oxide catalysts. This review paper is conduct by doing a research from the previous article to analyse and get the information. The calcium oxide is the most common catalyst that use in the reaction of biodiesel. The reaction parameters used in this review paper is the reaction time, methanol:oil ratio and the reaction time. From the reaction parameters, the optimize result of biodiesel yield is be compared. The edible oil contain highest result of optimization of biodiesel compare to the non-edible. The mixed metal oxide will get better optimization compare to the mixed oxide catalyst because of the doped of metal in the mixed oxide will increase the yield of the process

***Keywords*:** Biodiesel, Feedstocks, Heterogenous Catalysts, Transesterification, Optimization

Objectives:

- To compare the reaction condition (temperature, reaction time, methanol to oil ratio) by using various feedstock with various mixed metal oxide
- To compare the optimization of biodiesel production by using various feedstock with various mixed metal oxide

Methodology:



Results:

Feedstock	Catalyst	Temperature	Methanol:Oil Ratio	Reaction Times	Yield
Soybean Oil	$MgFe_2O_4/CaO$	70	12:1	180	98.3 [66]
Sunflower Oil	CaO/AuNPs	65	9:1	180	97 [50]
Waste Lard	CaO/zeolite	65	30:1	75	90 [48]
Calophyllum Inophyllum	Zn/CaO	55	9:1	80	89 [39]

Oil					
Waste Cooking Oil	CaO/MgO	90	15:1	120	96.4 [19]
Algal Oil	CaO/Al2CO3	50	3.2:10	125	89 [67]
Palm Oil	CaO	65	15:1	240	93.44 [68]
Waste Cooking Oil	Sr-Ti	60	11.1	80	98 [69]
Castor Oil	Ni/ZnO	55	8:1	60	95.2 [70]
Rubber Seed Oil	CaO	65	9. 1	240	97.84 [37]

Conclusion:

From the review paper and the comparison study, it can be concluded that biodiesel production is very important and needed for the replacement of fuel. Many ways can be decided for the production but the most common and best ways is by using transesterification process. The heterogenous catalyst should be choose for biodiesel production because of the several advantages such as the reducing of cost production, the reusability and the safety to the environment. This study show different mixed metal oxide has different type of biodiesel yield based on the alkalinity and basicity. Based on the result, it shows that $MgFe_2O_4$/CaO has the highest biodiesel yield. In term of reaction parameter, the best condition to gain the optimize result of biodiesel for parameter reaction time and temperature is to increase the reaction time and decrease the temperature because both of this relationship is inversed proportional to gain the result. The decrease of temperature also helps in term of achieved the objective of the optimization or also known the theory of optimization which to gain maximize product with the minimize cost. From this study, the recommendation that can be given for the future study is to analyse the biodiesel production with different parameters such as temperature, methanol to oil ratio and reaction time so more detail data will be produced for the optimization of biodiesel.