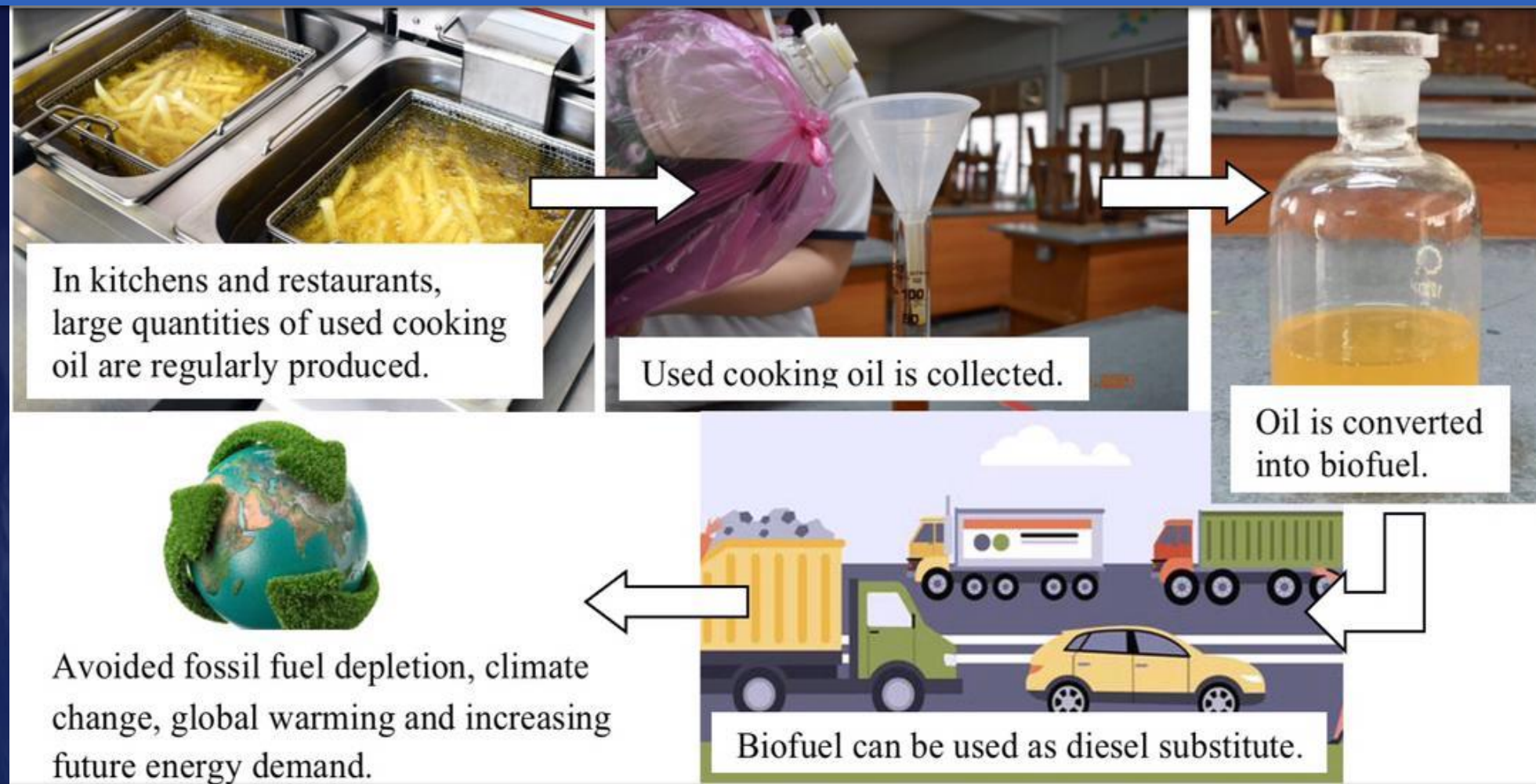


SYNTHESIS AND PURIFICATION OF WASTE COOKING OIL INTO BIOFUEL USING BIOMASS ACTIVATED CARBON TOWARDS A SUSTAINABLE ENVIRONMENT

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INTRODUCTION



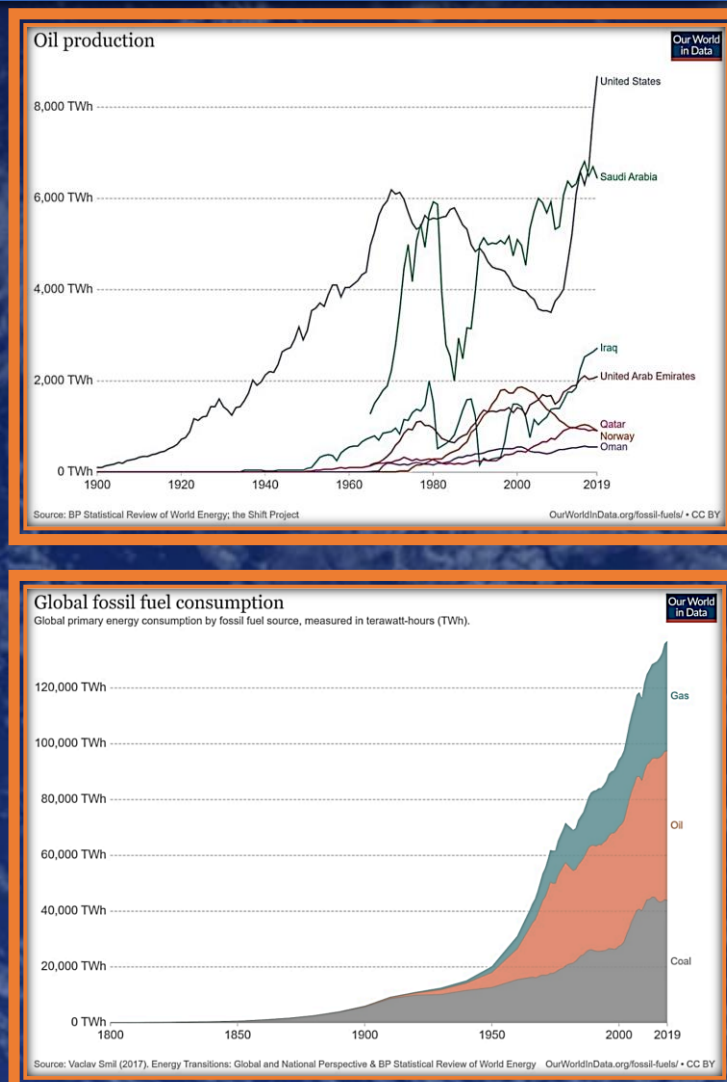
PROBLEM STATEMENT

Fossil fuel depletion

Increasing future energy demand

Climate change

Global warming



OBJECTIVE

To develop biomass activated carbon (BAC) derived from agricultural waste namely:

- sugarcane bagasse, coconut husk and banana peel is tested as a heterogeneous catalyst in the transesterification of waste cooking oil (WCO) with methanol to produce biofuel.

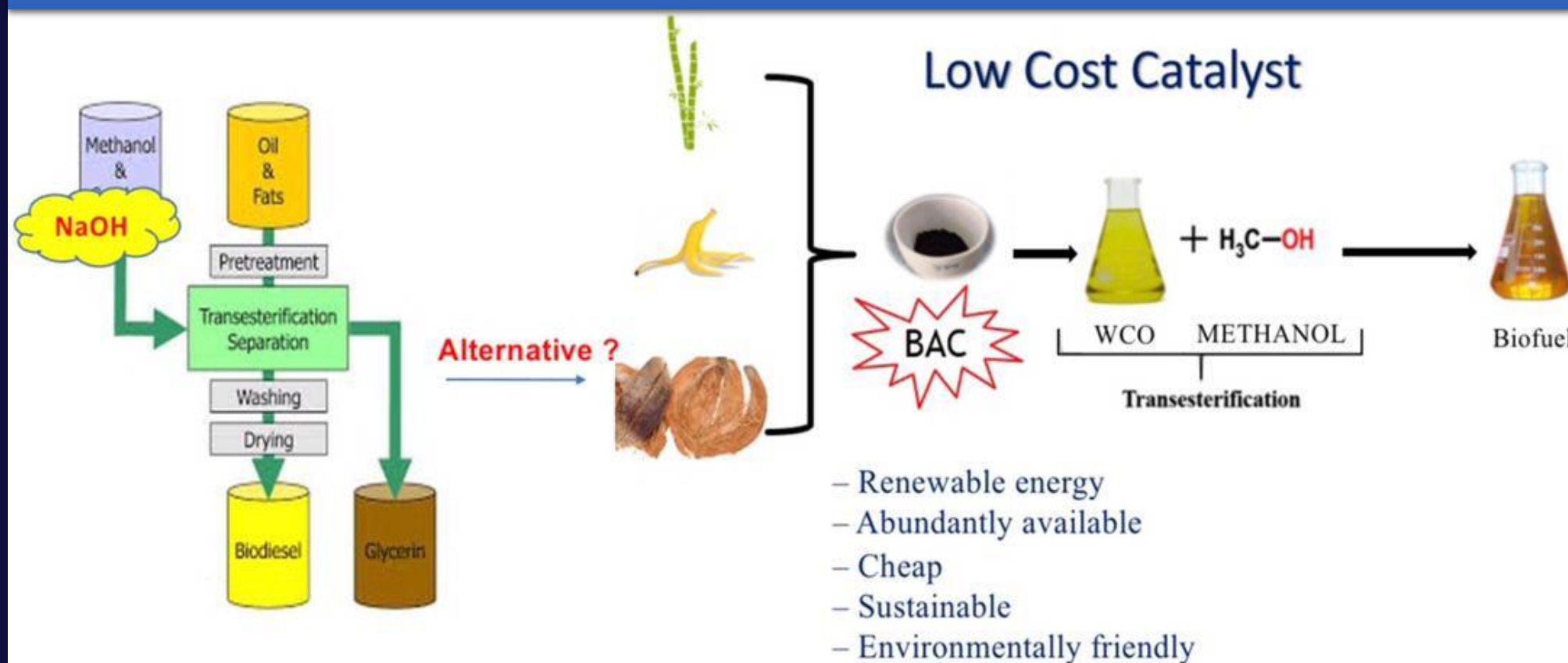
To investigate the potential of newly developed

- BAC in production of biofuel.

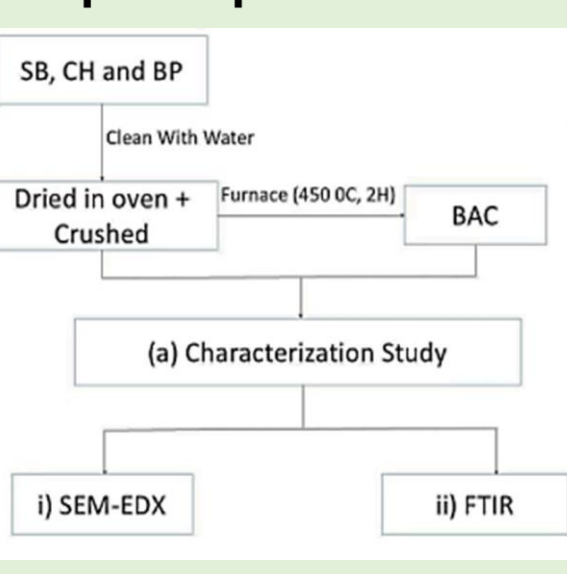
To study the characterization of biofuel produced

- Meets the Malaysian Standard (MS2008).

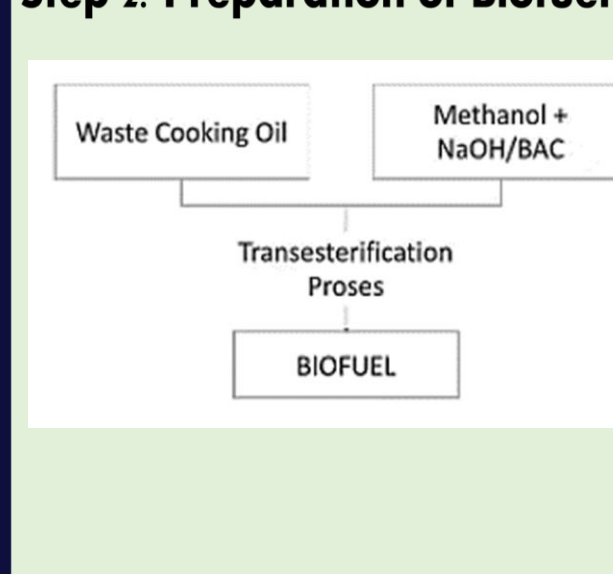
METHODOLOGY



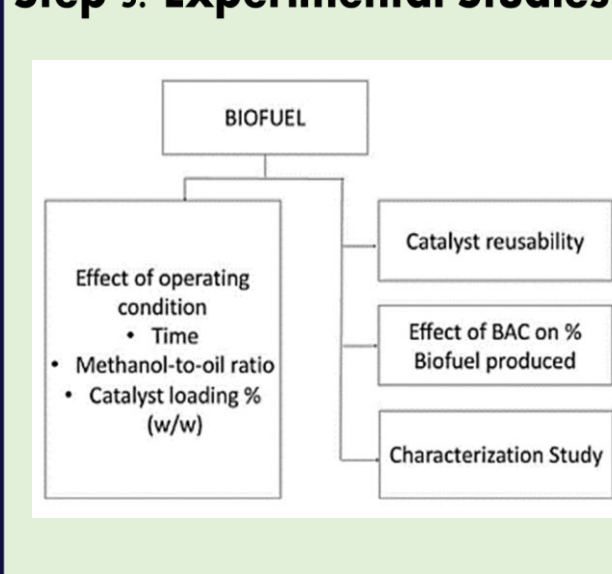
Step 1: Preparation of BAC



Step 2: Preparation of Biofuel



Step 3: Experimental Studies



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Alha, N.S.; Sulaiman, S. Overview of catalysts in biodiesel production. *Arpn J. Eng. Appl. Sci.* 2016, 11, 439–442.
 Asri, W. & Budiman, A. Synthesis of biodiesel from second-used cooking oil. *Phys. Procedia* 32, 190–199 (2013)
 Colombo, K. & Ender, L. The study of biodiesel production using CaO as a heterogeneous catalytic reaction. *Egyptian J. Pet.* 26, 341–349 (2017)
 Mannu, A.; Ferro, M.; Colombo Dugoni, G.; Panzeri, W.; Petretto, G.L.; Urgeghe, P.; Mele, A. Improving therecycling technology of waste cooking oils: Chemical fingerprint as tool for non-biodiesel application. *WasteManag.* 2019, 96, 1–8
 Ong H.C, Mahlia T.M.I, Masjuki H.H. A review on energy scenario and sustainable energy in Malaysia. *Renewable and Sustainable Energy Reviews* 2011; 15:639-647

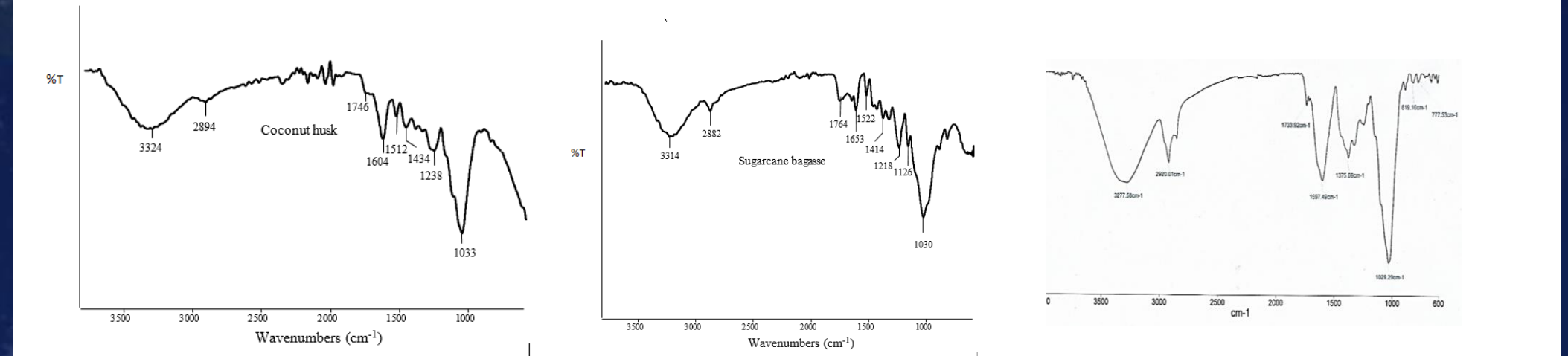
RESULTS AND DISCUSSIONS

CHARACTERIZATION OF BAC

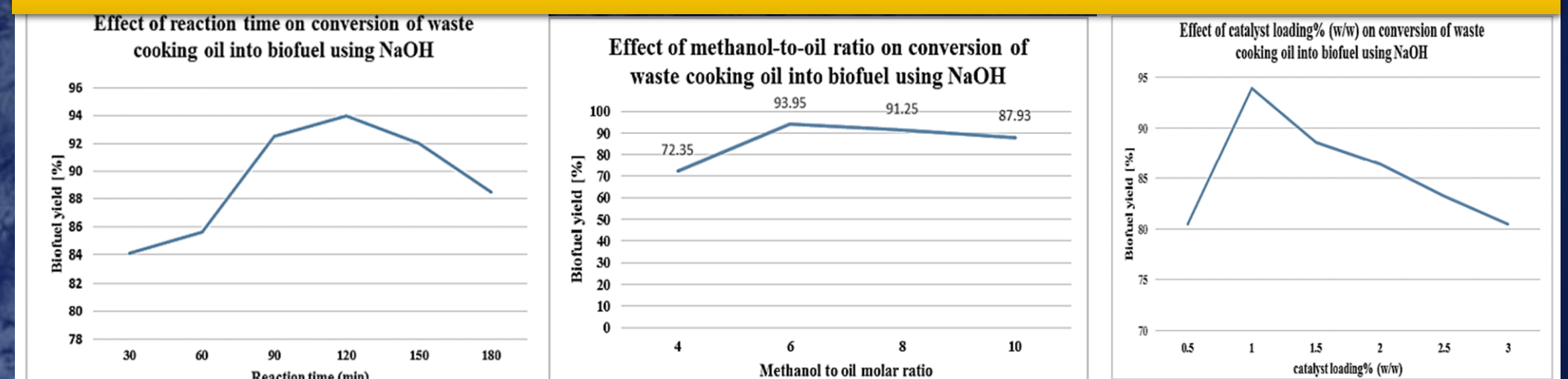
SEM Analysis



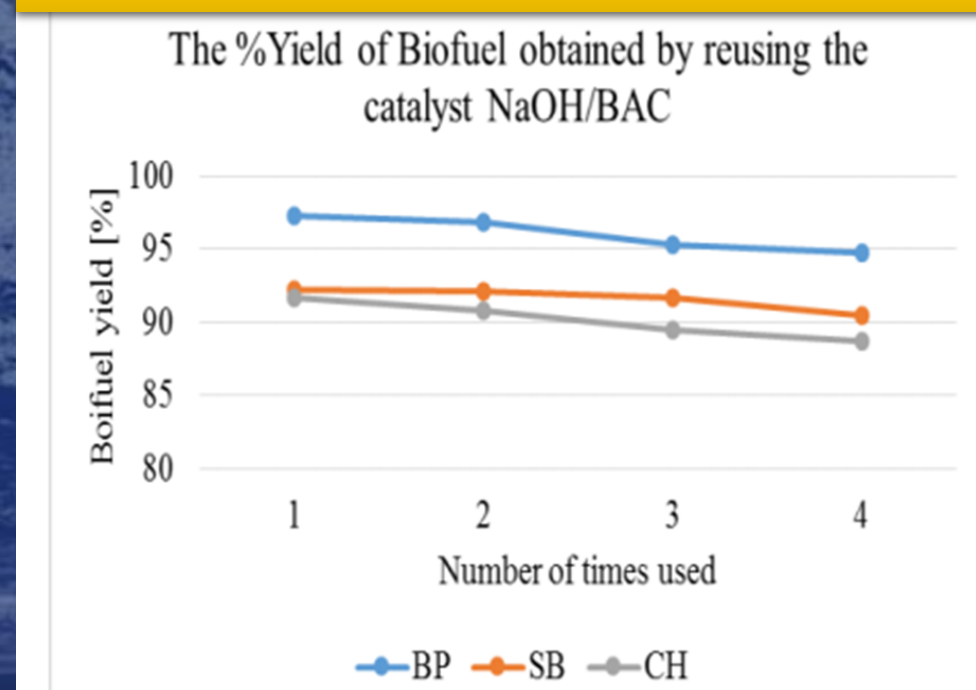
FTIR Analysis



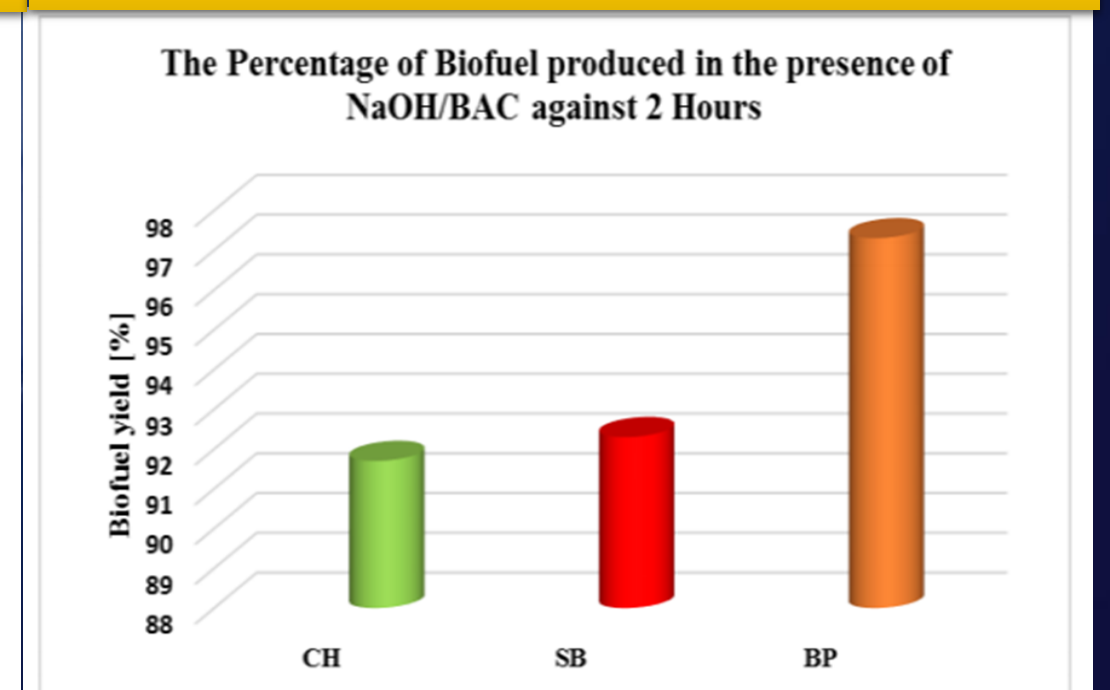
EFFECT OF DIFFERENT OPERATING CONDITION ON BIOFUEL YIELD



CATALYST REUSABILITY



EFFECT OF BAC ON BIOFUEL YIELD



BIOFUEL CHARACTERIZATION STUDY

Property	MS 2008: 2008 (Malaysian Standard)	Normal Palm Biodiesel	Biofuel derived from WCO using NaOH/BAC
Density at 15 °C (g/cm ³)	0.86-9.0	0.8783	0.8699
Viscosity at 40 °C (mm ² /s)	3.5-5.0	4.4	4.4
Flash point °C	120	182	105
Cloud point °C	-18-0	15.2	10.6
Pour point °C	-21-0	15	15.2

HEAT OF COMBUSTION

Type of oil	Mass used to increase 60°C(g)	Molar mass (g/mol)	Heat of combustion (KJ/mol)
Biofuel	1.51	293	4846.15
Diesel	1.20	250	5250.00

