

**CO-PYROLYSIS OF USED FACE MASK AND
EMPTY FRUIT BUNCH FOR BIO-OIL
PRODUCTION**

SYARIFAH ATHASHA BINTI SHAIB ALIWI

**BACHELOR OF CHEMICAL ENGINEERING
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FRUIT BUNCH FOR BIO-OIL PRODUCTION**

By

SYARIFAH ATHASHA BINTI SHAIB ALIWI

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ABSTRACT

The increase of global energy demand and decreasing of fossil fuels resources present a serious challenge in the future in terms of global warming and energy sustainability. To overcome these issues, renewable energy is needed. Biomass is one of the potential renewable energy that can substitute fossil fuels via pyrolysis. The liquid produced from pyrolysis biomass is known as pyrolysis oil or bio-oil. Bio-oil from pyrolysis biomass contains high level of oxygen leads to low calorific value, instability and corrosion issue. Co-pyrolysis biomass with plastics is one of the alternative method to produce high-grade bio-oil. In this study, empty fruit bunch (EFB) and plastics from disposable face mask (FM) was selected as the reactant and co-reactant. Co-pyrolysis of EFB and FM was carried out in a fixed-bed reactor with varying temperatures ranging from 400°C to 700°C and blending ratios from (100:0 to 0:100) at a fixed heating rate 10°C/min and 45 mins reaction time. The characterization of bio-oil was determined by gas chromatography-mass spectroscopy (GC-MS) and Elemental analyser. Based on the results, temperature 600°C was selected as optimum temperature as it gives the maximum co-pyrolysis bio-oil yield of 56.30%. The optimum blending ratio of EFB: FM of 25:75 was selected as it shows the significant result of hydrocarbon content. By the addition of 75% of face mask into 25% of empty fruit bunch can produce 61.26% of hydrocarbon in bio-oil. With the addition of plastics from FM, the H/C ratio increased from 0.15 to 0.17 while the oxygen content of bio-oil is reduced from 40.20% to 3.53% as compared to EFB derived oil. Bio-oil with a heating value of 47.78 MJ/kg was obtained which was equivalent to the commercial diesel (42-46 MJ/kg). Therefore, bio-oil can be regarded as potential renewable energy fuels that can substitute the fossil fuels in the future.