

**CO-PYROLYSIS OF ORANGE PEEL AND
POLYSTYRENE FOR BIO OIL PRODUCTION**

FARAH NUR SYAHIRA BINTI NORDIN

**BACHELOR OF CHEMICAL ENGINEERING
(ENVIRONMENT) WITH HONOURS**

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FOR BIO OIL PRODUCTION**

By

FARAH NUR SYAHIRA BINTI NORDIN

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ABSTRACT

Transformation of biomass and plastic waste by co-pyrolysis is a potential way to create high-grade bio-oil. This study investigated the co-pyrolysis of orange peel (OP) with waste polystyrene (PS) for the production of bio-oil. The effect of temperature and blending ratio on the yield and chemical composition of bio-oil was investigated. The reaction temperature and orange peel to polystyrene ratio were varied from 300°C to 700°C and from 0:100 to 100:0, respectively. 400 °C and OP to PS ratio of 25:75 were selected as the optimal temperature and blending ratio for the co-pyrolysis of OP and PS. Bio-oil produced at this reaction condition was rich in high-value organic chemicals, such as hydrocarbon and aromatic. A maximum bio-oil yield of 55.73 wt.% was achieved at OP to PS ratio of 25:75. Increasing the PS ratio enhanced the H/C ratio in the mixture. Thus, more hydrogen is transferred to OP to react with OP-derived radical. Adding 75% of OP to PS significantly reduces the PAH from 59.95 wt.% to 1.7 wt.%. Inhibition of PAH at OP: PS ratio of 75:25 could be due to the synergistic interaction between OP and PS pyrolyzes. Moreover, the oxygen content significantly reduced from 53.03wt.% to 12.01 wt.%, and this composition gave rise to a greater HHV of 40.01 MJ/Kg, close to that of commercial liquid fuels, such as diesel (42 MJ/Kg). This finding indicates that the co-pyrolysis used in this work can lead to production of valuable aromatic chemicals. Using these wastes to produce pyrolysis oil could reduce the landfill needed, decrease waste treatment costs, and solve environmental problems.