

Optimisation of microwave-induced co-pyrolysis of waste engine oil with palm kernel shell for the synthesis of diesel-like fuel using RSM

ABSTRACT

The microwave-induced co-pyrolysis of waste engine oil (WEO) with palm kernel shell (PKS) for diesel-like fuel production was effectively optimised using responses surface methodology (RSM). The reaction temperature (oC) and the WEO-to-PKS ratio were optimised using parametric studies. This study optimises the pyrolytic oil yield while maintaining a good fuel characteristic. The pyrolytic oil yield and properties significantly affect the reaction temperature and feedstock ratio. The pyrolytic oil with a reaction temperature of 500 oC and a feedstock ratio of 75:25 (PKS:WEO) had the highest oil yield of 36.87wt%. According to the optimisation study, the optimal temperature was 480 oC and the PKS-to-WEO ratio was 33:67, yielding the highest pyrolytic oil of 36.90wt%. The pyrolytic oil was characterised using FTIR analysis. The pyrolytic oil contains a high fraction of aliphatic hydrocarbons and a low fraction of aromatic hydrocarbon. As a result, pyrolytic oil is expected to have a high heating value (HHV) and potentially be used as a diesel-like fuel.