

Microwave-induced pyrolysis of waste truck tyres with carbonaceous susceptor for the production of diesel-like fuel

ABSTRACT

Microwave-induced pyrolysis technique was utilised to pyrolyse waste truck tyres (TT) into useful pyrolysis oil with the aid of activated carbon. The effect of temperature was studied to determine the truck-tyre pyrolysis oil (TTPO) yield, hydrocarbon fractions, chemicals composition, energy yield and fuel properties. The activated carbon functions as microwave absorber to elevate the pyrolysis temperature for enhancing production of pyrolysis oil. The optimal pyrolysis temperature of 500 °C produces highest TTPO yield of 38.12 wt% with calorific value of 42.39 MJkg⁻¹ and energy yield of 40.55 wt%. Detailed analysis shows the TTPO contained large amount of aromatic hydrocarbons and limonene (14.29%) compared to pyrolysis oil from personal car tyre. Among the important chemical compounds also discovered in TTPO are benzene, toluene, xylene (BTX). The relative yields of toluene obtained at 400 °C is 14.85%, whereas the relative yields of benzene and xylene at 450 °C were 0.85 and 7.60%, respectively. The physiochemical properties of TTPO500 are rather similar to conventional diesel, except the slightly lower flash point and calorific value for the former. This work shows that microwave-induced pyrolysis is a promising technique to recover diesel-like fuel for use as supplemental alternative fuel.