

## Diesel Fuel from Plastic Waste

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The developing of alternative fuel has been investigated in the past decade due to the fast depletion of fossil fuels [1]. The aim of these technologies is to recover energy from waste materials, including materials that are not biodegradable, such as biomass, municipal solid wastes, agricultural wastes and as high energy density materials such as rubber and plastics [2].

Plastic are non-degradable polymers which contain carbon, hydrogen and others elements (chlorine, nitrogen, etc.). Due to its non-biodegradable nature, this compound contributes significantly to the problem of waste management.

There are different environmentally friendly ways of recycling plastic waste compared with incineration and disposal in landfills. ASTM D7209-06 indicates that the plastics can be recycled using four types of methods according to the final result, one of them being the chemical recycling. In this method, chemical degradation leads to production of liquid fuels and chemicals with high added value from waste plastic fragments or segregated. One of this method is pyrolysis.

Pyrolysis is the thermal decomposition of long chained hydrocarbon compounds into smaller ones in absence of oxygen at temperatures above 500°C generating gaseous and liquid products [3]. To complete the reaction at this temperature is necessary to use a catalyst. The obtained oil may be used directly as a fuel and the gases (composed of C1-C4 hydrocarbons and hydrogen) act as fuel to provide the heat for the pyrolysis process. Furthermore, the inorganic part of the plastic remains practically unchanged in the solid fraction enabling their separation and recovery for subsequent reuse, as carbon black or upgraded to produce an activated carbon [3]. Taking into account that it is possible to obtain an alternative fuel which can be used in engines without any modification, the pyrolysis could be an attractive alternative technique for waste plastics recycling [4].

The properties of the diesel fuel obtained by pyrolysis has been studied by many authors [5], being suitable to be used in vehicle engine [6] although the performance and emission characteristics were much inferior to diesel fuel [7]. On the other hand, it has been demonstrated that diesel obtained by this method is free of lead, sulphur or nitrogen and the quality of the obtained fuel is comparable with the values of the regular diesel [8].

Finally, it could be concluded that it is possible to obtain diesel fuel from plastic waste and the pyrolysis oil could be used as an alternative fuel for diesel engines in the future, having two benefits: to recover energy from waste and reduce the environmental problems caused by this waste.

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