Faculty of Engineering

Department of Chemical Engineering

# Production of High Value Liquids and Gases from Solid Wastes

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Presented by

**Aya Soliman Mohamed Moustafa**

B.Sc. in Gas and Petrochemical Engineering, Faculty of Engineering
Alexandria University, 2012
M.Sc. in Chemical Engineering, Faculty of Engineering, Alexandria University, 2015

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# ABSTRACT

The researchers have concentrated on the increasing depletion of oil resources and the increase of energy demand to find alternative ways to produce high-quality oils that could replace fossil fuels. Waste plastics are desirable for energy conversion, because of their high combustion heat and bulk availability. Due to the wide variety of plastic products in domestic as well as industrial purposes, exponential rate of increase in plastic production occurs in every year. Naturally, the drastic increase in plastics usage leads to large amounts of plastic waste which is harming the environment due to their disposal issues. It is highly advisable to turn plastic to high-quality liquid oil through the pyrolysis cycle as the oil produced has a lower calorific value than commercial petrol. In this work, LDPE has been pyrolysed in a 1 m length semi pilot reactor (semi batch type) at temperature range 550-650°C for around 2 hrs. Commercial bentonite, kaolin, silica Gel and activated charcoal have been used as catalyst. Liquid, gas and solid fractions (residue) were quantified. Effects of pyrolysis temperature and catalysts on liquid product were investigated. It was found that using catalyst gave shorter dripping time and this dripping started at a lower temperature. Characterization of liquid oil product by using (PIONA) analysis for deretmination of paraffins, isoparaffins, olefins, naphthenes and aromatics of liquid product has been carried out and the highest percentage of olefins was found on using bentonite as a catalyst. Thus this result is in favor producing raw materials for petrochemical industry. On the other hand, regarding storage stability the product obtained on using bentonite and kaolin is recommended in this respect. On using mixed catalysts (bentonite and kaolin) or (bentonite, kaolin, silica gel and activated charcoal) the liquid yield was not different than the yield without a catalyst. Nevertheless, the merit of using the catalyst was clear on increasing the rate of liquid production, where reduction of almost 44% in total dripping time.