Pyrolysis of polypropylene in a semi batch reactor: the importance of the reflux to control the product composition

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ABSTRACT

Plastics are one of the most widely used materials due to their various advantages and numerous applications in our daily life. Their consumption and production have increased worldwide every year and the waste generated by their production, transport and disposal create lots of environmental issues. Pyrolysis, which is a thermal reaction in an inert environment, is considered as one of the most promising technologies for plastic waste, which are complicated to mechanically recycle or are difficult to depolymerize. Pyrolysis seems to be an interesting and environmentally friendly way for a long-term sustainable use of waste. Indeed, it converts plastic waste into three products: wax/residue, liquid and gas. The liquid has always been attractive due to its potential use as chemical feedstock or fuel.

Despite the usefulness and simplicity of the pyrolysis process, the products are characterized by a very wide distribution of hydrocarbons that leads to a lot of post-pyrolysis treatment to increase the value of the liquids obtained. Therefore, the main objective of this project is to study the influence of a reflux on a semi-batch reactor (Fig.1) in order to increase the residence time of the hydrocarbons and obtain a narrow distribution of light molecular weight compounds, which are highly valuable.

The experiments showed that the temperature of the reflux has a significant impact on the liquid yield. More specifically, by increasing the reflux temperature, the amount of liquid was increased and characterized by a lighter average molecular weight [1], [2].