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The influence of process parameters of the cracking thermoplastic polymers to yield products

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Abstract

This article studies the recycling processes of thermo-plastic polymer of isotactic structure (on the example of polyethylene) and establishes the dependence between process parameters (temperature and heating rate).

The following methods of thermocatalytic destruction are suggested: the first way is to uniform heating of raw materials (5 deg/min) in inert atmosphere; the second way is conducted using the same heating rate but in the flow of inert gas; the third way is conducted using irregular heating of the polymer up to 500 °C in inert atmosphere.

All processes were carried out using 10 % mass. of aluminosilicate catalyst. It has been proven that products yield using cracking of polypropylene depends on heating rate of polymer: as higher the heating rate, as bigger is the amount of product yield, this is due to a decrease in viscosity melt and the decrease in the percentage of side reactions of isomerization.

It has been established by experimental means that the third way is the most effective method of processing because there is a fast heating of raw material up to the temperature that is more then temperature of viscos flowing. At the same time, the resistance to deformation decreases due to the insufficient speed of their relaxation, the reactions of cracking molecules actively proceed, hence, the melt viscosity decreases, and the yield of primary products exceeds their capture, which is confirmed by the amount of liquid product yield. This method makes it possible to obtain a larger amount of liquid hydrocarbon product of a mixed base, which is the raw material for the production of synthetic motor fuels and petrochemical raw materials, and a significant amount of gas of heterogeneous hydrocarbon composition. It is advisable to direct a gaseous product to a gas fractionating unit in order to separate individual hydrocarbons and produce liquefied gas, which can be used as a fuel, or used for heating furnaces.

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