



EXPERIMENTAL RESULTS AND MATHEMATICAL MODEL FOR THE PROCESS OF CARBON BLACK PRODUCTION IN HIGH TEMPERATURE FLOW REACTOR

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ABSTRACT

Carbon black is one of the main components for productions of tires, rubbers and plastics. Properties of the final manufacturing product depend on the physicochemical properties of carbon black. That is why it is important to investigate and to modernize regimes of carbon black production. The most common way of producing is the growth of carbon black particles in high temperature flow reactor after evaporation of liquid hydrocarbonic raw material.

For an investigation of carbon black producing regimes an installation with productivity of 10 kg/h was designed and operated. Its construction allows spraying a liquid hydrocarbonic raw material into high temperature gas flow having the temperature of 1300-1500 °C. Droplets of this raw material are evaporated and dissolved due to pyrolysis reaction. Obtained gas mixture is saturated with carbon. Then the growth of finely-divided carbon black takes place in the terms of a carbon nucleation from gas phase. Finally this mixture is cooled by spraying water into it and formed carbon black particles are caught by sleeve filter.

A number of experiments of carbon black production were carried out. Some physicochemical values of this process such as temperature, pressure, composition of gas mixture (H_2 , CO, CO_2 , CH_4 concentrations) were registered.

A mathematical model of hydrocarbonic droplets evaporation was formulated. The calculation revealed a fact, that these droplets are evaporated rapidly and this evaporation doesn't limit the technological process of carbon black producing in the flow reactor.

Keywords: carbon black, pyrolysis reaction, flow reactor