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THERMAL AND CATALYTIC CRACKING OF PARAFFINS AT HIGH PRESSURE

by

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The data available in the literature on the influence of pressure on the rate of thermal cracking of individual paraffins (at a constant temperature) relate to the low-pressure range. Dintses [1] gives data indicating that the rate of thermal decomposition of n-butane at 575°C is increased when the pressure rises from 3.9 to 10.8 atm. Dintses et al. [2] noticed a retardation of the ethane decomposition when at a temperature of 635°C the pressure rose from 1 to 26 atm. However, at 750°C and 800°C the rate of ethane decomposition increases with a rize in pressure (in the pressure range to 10 atm.) [3]. Thermal decomposition of n-heptane at 580°C and a pressure up to 8.7 atm. [4] also showed an increase in reaction velocity with pressure increase.

The investigations in the range of pressures over 1000 atm. are restricted to one article only [5] on the thermal decomposition of n-hexane at 1002 kg/cm^2, so that no conclusions can be drawn on the change in velocity with the pressure.

The influence of high pressure on catalytic cracking of individual paraffins has not yet been investigated. The data available in the literature on catalytic cracking under pressure (see for instance [6]) relate to various temperatures and permit conclusions on the cracking rate (and destructive alkylation) at a simultaneous change in temperature and pressure.

In the present investigation the influence was studied of high pressure on the rate of thermal and catalytic cracking of n-heptane and n-hexane. The investigation was conducted in vibrating reactors. The temperature was kept constant within ± 2°C. Duration of experiments 3 hours; after this period the reactor was rapidly cooled with water.

The n-heptane and n-hexane were cut in a rectifying column with 30 theoretical plates and purified by chromatographic adsorption.

Physical constants of purified n-hexane: d_4^{20} 0.6594; n_D^{20} 1.3750; according to the literature [7]: d_4^{20} 0.65937; n_D^{20} 1.37486; b.pt 68.4-68.8°C (760 mm).