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PROCESS FOR CRACKING HYDROCARBONS IN THE LIQUID STATE

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2 Claims. (Cl. 204—172)

This invention relates to a process for cracking hydrocarbons in the liquid state and is more particularly concerned with a process for cracking under reduced pressure liquids consisting of or containing hydrocarbons by means of a plurality of arcs which burn intermittently in the liquid at auxiliary electrodes as the latter are moved out of contact with spaced main electrodes by the gases which are evolved, this process being the subject of our copending application Serial No. 539,863, filed October 11, 1955.

In a further development of the process of the above-mentioned copending application Serial No. 539,863, it has been found that the process can be carried out with an increased yield of acetylene if the hydrocarbons which are to be cracked are kept at relatively high temperatures, preferably at temperatures which are 15–40° C. below the mean boiling point of the mixture which is used. Particularly good yields are obtained if high-boiling hydrocarbon mixtures are used which have a lower boiling limit higher than 100° C., preferably higher than 150° C. at a pressure of 100 mm. The temperature of the hydrocarbons to be cracked is preferably kept constant by means of heat exchangers, which supply heat at the commencement of the cracking operation and subsequently dissipate the excess heat generated by the large number of small arcs. Since the working temperature is usually higher than 100° C. the heat given off by the cracking apparatus can with advantage be utilised for other purposes. Those readily volatile constituents of the hydrocarbon mixtures which evaporate at the working temperature or are entrained by the cracking gases being developed are preferably liquefied in a condenser and returned into the reaction chamber in accordance with the process of the present invention.

It is also preferable that the hydrocarbon mixtures to be cracked should be conducted in circulation through a purifying plant to separate out the dust formed by the wear on the electrodes and any solid cracking products which may be formed, in order to avoid an untenable increase in viscosity, and then to introduce the hydrocarbons in such a quantity into the cracking chamber that a sufficient depth above the electrode grid is ensured. In order to facilitate the lifting of the moving auxiliary electrodes, the cracking vessel, the cracking liquid or the electrodes can be kept vibrating.

The following examples show the rise in the content of acetylene in the cracked gas when the liquid to be cracked is kept at relatively high temperatures.

Example 1

Cracking a 50 mm. deep layer of coke-gas benzine II (B. $P._{40}$ 150° C.) with a pressure of 40 mm. Hg in the cracking vessel. Twenty-five spherical auxiliary electrodes are used. The values given in column 1 relate to the method according to our copending application Serial No. 539,863, while those in columns 2 to 5 relate to the process of the present invention; of these, columns 4 and 5 correspond to the preferred embodiment of the process of the present invention.

Temperature, ° C.		70	100	129	129
C_2H_2+homologues	25.61	36.60	36.10	36.70	36.95
propylene+butylene	0.61	1.69	1.68	1.22	1.46
C_2H_4	3.90	7.85	7.83	5.36	5.38
H_2	69.70	53.60	54.10	56.70	56.00
CH_4+homologues	0.24	0.26	0.25	0.20	0.22

Example 2

Cracking of a 10 mm. deep layer of a high boiling point residue of B. $P._{40}$ 195 to 210° C. at a pressure of 40 mm. with ten spherical auxiliary electrodes. A composition of the cracked gases will be seen from the following table:

Temperature, ° C.	150	190	205
C_2H_2+homologues	39.97	41.43	42.05
propylene+butylene	0.99	1.00	0.68
C_2H_4	2.82	2.80	2.60
H_2	55.90	54.80	54.50
CH_4+homologues	0.20	0.22	0.23

As will be seen from the examples, the main advantage of the present process as compared with the process of the copending application Serial No. 539,863 which is carried out at normal temperature consists in an improved yield of acetylene, which in Example 2 results in an increase of about 70% in the acetylene fraction in the cracked gas. It is obvious that the increased acetylene content also substantially facilitates the separation and recovery of the diacetylene which is formed.

In addition to a better exploitation of energy as compared with the process of the copending application Serial No. 539,863 the process according to the present invention also provides a possibility of recovering heat, which can be used with advantage for technical purposes.

What we claim is:

1. In a process for cracking a hydrocarbon mixture in the liquid state, said mixture having a lower boiling point higher than 150° C. measured at 100 mm. Hg pressure, to produce gaseous cracked products in which the cracking is effected by a plurality of arcs which intermittently burn between spaced main electrodes and auxiliary electrodes as the latter are moved out of contact with the spaced main electrodes by the gases which are evolved, the steps which comprise carrying out such cracking process at a pressure up to 100 mm. Hg and maintaining the temperature of the hydrocarbon mixture being cracked above 150° C. but below the mean boiling point of such hydrocarbon mixture when measured at 100 mm. Hg.

2. The process of claim 1 in which the temperature of the hydrocarbon liquid to be cracked is maintained constant.

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