[Third Edition.]

PATENT SPECIFICATION

Application Date: March 11, 1941. *No. 3316/41.* **574,973**

(Patent of Addition to No. 552,216 : dated Jan. 17, 1940).

Complete Specification/Left : Feb. 27, 1942.

Complete Specification Accepted : Jan. 29, 1946.

3891

PROVISIONAL SPECIFICATION.

Improvements in and relating to the Production of Aromatic Hydrocarbons.

I, CHARLES WEIZMANN, a British subject, of 77, Great Russell Street, London, W.C.1, do hereby declare the nature of this invention to be as follows :—

This invention relates to the production of aromatic hydrocarbons.

In the main copending Application No. 8961/40 I have described a simple process for the conversion of mineral oils, either refined or unrefined, sulphur containing or not, into aromatic hydrocarbons.

The object of the present invention is an improvement in or modification of that of the main Application.

The invention consists in a process in accordance with the main Application, in which the starting material is an oil of convenient boiling range originating from the hydrogenation of coal or of high boiling mineral oils or of tars or originating from the Fischer Tropsch process, the starting material being subjected to the action of a metallic catalyst at a temperature between about 500° C. and about 800° C.

The invention also consists in processes for the production of aromatic hydrocarbons substantially as hereinafter described, and in aromatic hydrocarbons prepared or produced by the methods or processes of manufacture particularly described and ascertained.

In carrying the invention into effect, the process is carried out in accordance with the Examples and the general statements regarding catalysts, pressures, temperatures and other factors mentioned in the main case, modified as necessary in accordance with the new starting materials, which, as explained above, are the oils of convenient boiling range originating from the hydrogenation of coal or of high boiling mineral oils or of tars or originating from synthetic processes such as the Fischer Tropsch process.

Dated this 11th day of March, 1941.

MARKS & CLERK.

COMPLETE SPECIFICATION

Improvements in and relating to the Production of Aromatic Hydrocarbons.

I, CHARLES WEIZMANN, D.Sc., Sc.D., LL.D., a British subject, of 77, Great Russell Street, London, W.C.1, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement; —

This invention relates to the production of aromatic hydrocarbons by the utilisation of the products resulting from certain synthetic processes as indicated more fully below.

In the main co-pending Application No. 8961/40 (Serial No. 552,216) I have described a process for the production of a substantially complete aromatic hydrocarbon product, either in one pass, or by re-cycling the incompletely aromatic hydrocarbon product formed in one pass, according to which natural mineral hydrocarbon oil in the form of its vapour is subjected as such to the action of a metallic hydrogenation and dehydrogenation catalyst at a temperature between 500° C. and 800° C. and at about atmospheric pressure, and at a space velocity of 0.1 to 0.5 litres of the oil per litre catalyst volume per hour.

The object of the present invention is an improvement in or modification of that of the main Application, which modification results from the fact that I have found synthetic products of suitable boiling range are also amenable to treatments similar to that in the main Application.

[*Price 2/-*]

As a result it is possible to provide a process for the conversion of synthetic products as referred to below into substantially pure aromatic hydrocarbons, i.e., for their substantially complete aromatisation, either directly or by effecting partial aromatisation and return to the process for re-cycling to complete aromatisation.

The starting material is a hydrocarbon oil boiling within the range 150—400° C. or fractions thereof originating from certain synthetic processes, namely, the Fischer Tropsch process or the hydrogenation of coal or of high boiling mineral oils or of tars.

In the prior art, Specification Nos. 313,916 and 480,442 deal with the cracking of hydrocarbon mixtures obtained synthetically from carbon monoxide and hydrogen, the cracking being effected in the presence of catalysts which may be metal catalysts at temperatures about 500° to 600° C., the products including substantial quantities of benzine or light hydrocarbons analogous to petrol.

The invention consists in a process according to the main Patent but in which the starting material is that of the second preceding paragraph, or in other words, the invention consists in a process for the production of a substantially complete aromatic hydrocarbon product, either in one pass, or by re-cycling the incompletely aromatic hydrocarbon product formed in one pass, according to which a hydrocarbon oil boiling within the range 150—400° C. or fractions thereof originating from certain synthetic processes, namely, the Fischer Tropsch process or the hydrogenation of coal or of high boiling mineral oils or of tars is subjected as such in the form of its vapour to the action of a metallic hydrogenation and dehydrogenation catalyst at a temperature between 500° C. and 800° C. and at about atmospheric pressure, and at a space velocity of 0.1 to 0.5 litres of oil per litre catalyst volume per hour.

The invention also consists in a process as set forth in the preceding paragraph according to which the synthetic hydrocarbon oil in the form of its vapour is passed through a tubular chamber containing the metallic hydrogenation-dehydrogenation catalyst, and thereafter into a cooling and condensing chamber, the liquid phase so obtained being suitably fractionally distilled.

The invention also consists in a process as set forth in either of the two preceding paragraphs wherein the catalyst is chosen from the following, namely, iron, copper, chromium, nickel, cobalt, their mechanical mixtures or their alloys.

The invention also consists in a process for the production of aromatic hydrocarbons as hereinafter described in the example.

The invention also consists in aromatic hydrocarbons when prepared or produced by the methods or processes of manufacture particularly described and ascertained.

In carrying the invention into effect in one form by way of example applied to the aromatisation of a Fischer Tropsch oil, i.e. an oil produced by a catalytic synthesis from producer gas, the oil was a colourless liquid of density 0.731 and a bromine consumption of 6.95 g. per 100 g. Assuming (from the boiling range) an average molecular weight of 150, the bromine consumption corresponds, therefore, to the presence of 7% olefines in the oil.

The Engler distillation figures were as follows :—

Initial boiling point	121° C.
5%	146° C.
10%	150° C.
20%	155° C.
30%	161° C.
40%	167° C.
50%	173° C.
60%	181° C.
70%	188° C.
80%	198.5° C.
90%	216° C.
95%	225° C.
Final boiling point	245° C.

In the cracking process, 245 cc. oil (=179.1 g.) were passed within 4¼ hours over the catalyst consisting of activated copper. The total catalyst volume was 660 cc., of which 440 cc. were exactly at the correct temperature of 680°, the space velocity, therefore, 0.13. The liquid condensed amounted to 28 cc. of a density of 0.870, therefore, 16% of the charging stocks. 147.5 litres gas (N.T.P.) were formed, of a density of 1.12 g./litre; the recovery of material therefore appears to be complete.

Fractionation of the liquid portion (25 cc.) showed that it was fully aromatised. 50% of the total liquid product boil up to 145°. Calculated on the charging stock, the following yields have been ascertained:

below benzene	1.1%
benzene	3.0%
toluene	1.9%
ethylbenzene fraction	1.9%
higher-boiling products	8.1%

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is :—

1. A process for the production of a substantially complete aromatic hydrocarbon product, either in one pass, or by re-cycling the incompletely aromatic hydrocarbon product formed in one pass, according to which a hydrocarbon oil boiling within the range 150—400° C. or fractions thereof originating from certain synthetic processes, namely, the Fischer Tropsch process or the hydrogenation of coal or of high boiling mineral oils or of tars is subjected as such in the form of its vapour to the action of a metallic hydrogenation and dehydrogenation catalyst at a temperature between 500° C. and 800° C. and at about atmospheric pressure, and at a space velocity of 0.1 to 0.5 litres of the oil per litre catalyst volume per hour.

2. A process as claimed in Claim 1 according to which the synthetic hydrocarbon oil in the form of its vapour is passed through a tubular chamber containing the metallic hydrogenation-dehydrogenation catalyst and thereafter into a cooling and condensing chamber, the liquid phase so obtained being suitably fractionally distilled.

3. A process as claimed in Claim 1 or Claim 2 wherein the metallic catalyst is chosen from the following, namely, iron, copper, chromium, nickel, cobalt, their mechanical mixtures or their alloys.

4. A process for the production of aromatic hydrocarbons as hereinbefore described in the example.

5. Aromatic hydrocarbons when prepared or produced by the methods or processes of manufacture particularly described and ascertained.

Dated this 27th day of February, 1942.
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