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PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Process for Manufacturing Nickel in a Finely Divided State in particular for the Catalytic Manufacture of Hydrogen from a Mixture of Methane and Water-vapour.

We NAAMLOOZE VENNOOTSCHAP DE BATAAFSCHE PETROLEUM MAATSCHAPPIJ, formerly known as De Bataafsche Petroleum Maatschappij, of 30, Carel van Bylandtlaan, The Hague, Holland, a Company organised under the laws of Holland, 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:—

The invention relates to the manufacture of nickel in a finely divided state particularly for the catalytic manufacture of hydrogen from methane and water-vapour, and a process for the manufacture of hydrogen in this way.

It is known that methane and other hydrocarbons can be converted into hydrogen and carbon dioxide by reaction with steam at high temperature under the influence of nickel as catalyst.

Further it is known that the state of the catalyst has a considerable influence upon the reaction, that is to say upon the yield of hydrogen. As a rule a fine distribution of the catalyst has a favourable effect, but other factors also appear to play a part which factors are concerned with the manner in which the catalyst is manufactured.

We have now found it possible to manufacture an extremely active nickel catalyst.

According to this invention the process for manufacturing an extremely active nickel catalyst consists in treating a solution of a suitable nickel salt with a solution (capable of converting the nickel salt into hydroxide) added in less than the theoretical quantity required to convert all the nickel salt present into hydroxide and in converting the hydroxide after separation, washing and drying into nickel by reduction with hydrogen.

A secondary advantage of working with less than the theoretical quantity of the said second solution, is that the washing with water may be carried out much more quickly than when an excess of the said solution is used.

Further it has been found to be of importance to carry out the reduction with hydrogen at a temperature of about 350° C. If necessary the nickel catalyst may be used with a promoter.

The following example serves to illustrate the invention.

40 grams of nickel nitrate $Ni(No_3)_2$ 6. aq. are dissolved in 600 cc. of water. This solution, into which, if necessary, a carrier can be introduced, is heated to about 40° C. and while stirring about 200 cc. of 5% NaOH solution is added in such a manner that the green colour of the dissolved nickel salt is still clearly perceptible.

The mixture is filtered and the precipitate is washed, first with hot water and then with cold water and then dried.

The product obtained is reduced with hydrogen at 350° C.

With the aid of a catalyst prepared in this manner methane is converted with 2.1 times an excess of steam. Thus with a contact volume of 18 cc. and by conducting the methane once over the catalyst at a speed of 600 cc. per hour at 650° C. a gas mixture is obtained which, after condensation of the water and absorption of the carbon dioxide, contains 72.4% hydrogen.

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

1. A process for the manufacture of a nickel catalyst in a finely divided state in particular for the catalytic manufacture of hydrogen from a mixture of methane and water-vapour which consists in treating a solution of a nickel salt with a solution (capable of converting the nickel salt into hydroxide) added in less than the theoretical quantity required to convert all the nickel salt present into hydroxide and in converting the

hydroxide into nickel by reduction with hydrogen.

2. A process for the manufacture of hydrogen-containing gases or hydrogen after separation of carbon dioxide from methane and water-vapour by conducting these gases at high temperature over nickel which may or may not be finely distributed on a carrier, characterised by employing as catalyst the nickel catalyst manufactured in accordance with claim 1.

3. A process as claimed in claim 1, wherein the solution of nickel salt contains a carrier upon which the hydroxide is precipitated.

4. The manufacture of a nickel catalyst substantially as described.

5. The manufacture of hydrogen-containing gases or hydrogen after separation of carbon dioxide substantially as herein described.

6. A nickel catalyst if desired distributed upon a carrier when manufactured according to claims 1, 3 or 4.

7. Hydrogen-containing mixtures or hydrogen after separation of carbon dioxide when manufactured by the process according to claims 2 and 5.

Dated this 31st day of May, 1929.

H. DOUGLAS ELKINGTON,
Consulting Chemist & Chartered Patent Agent,
20 to 28, Holborn, London, E.C. 1,
Agent for the Applicants.

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