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PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Process for Producing Catalysts for Benzine Synthesis

We, RUHRCHEMIE AKTIENGESELLSCHAFT, of Oberhausen-Holten, Germany, a body corporate organized and existing under the Laws of the German State, 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:—

A precipitated catalyst of cobalt which has been activated by the simultaneous addition of thorium and magnesium and which is suitable for benzine synthesis from oxides of carbon and hydrogen is known. This catalyst has proved superior to the known cobalt-copper-thorium catalyst which is obtained by precipitation on kieselguhr with respect both to the yield of reaction products and the useful life of the catalysts.

The production of these catalysts is rendered more difficult in some respects by the known use of kieselguhr as carrier mass for catalysts. Difficulties are involved in procuring a uniform kieselguhr since it occurs in nature in limited quantities only and the separate deposits of kieselguhr display large differences among themselves with respect to chemical composition and physical qualities. Furthermore, constituents of the carrier material dissolve while kieselguhr is being added to the alkaline precipitating solution for the catalytically active metals during the preparation of the catalysts, and also while the spent catalysts are being dissolved in acids, and thus render the catalyst impure and reduce its activity.

It has been found that for producing iron group catalysts, more particularly catalysts containing magnesium, for Fischer-Tropsch benzine synthesis, carbon dioxide compounds of magnesium can be used with advantage as carrier material, and it has been found that basic magnesium carbonate is particularly suitable. The production of such catalysts is effected in known manner by precipitating the catalytically active metals from corresponding metal salt solution. The carrier mass which consists of one of the previously described magnesium compounds is added directly after the precipitation of the metal catalysts and stirred with the precipitate.

The catalysts produced on magnesium carbonates behave during synthesis just like the catalysts precipitated on kieselguhr. In like reaction conditions they give normal yields on the conversion of mixtures of carbon monoxide and hydrogen into liquid hydrocarbons at the same low reaction temperature of from 180 to 185° C. Similarly the catalysts precipitate on magnesium carbonate can be regenerated in similar manner by treatment with hydrogen in the synthesis furnace itself. The catalysts according to the present invention are in no way inferior in their length of life to those hitherto used and that have been precipitated on kieselguhr. Thus if the catalysts according to the invention have shown themselves to be of quite equal value in their use for benzine synthesis, the advantage of using magnesium carbonates as carrier materials consists in the facility of procuring the raw materials. With respect to the raw material particularly relatively rare natural substances are not essential, in fact magnesium is found all over the earth in huge quantities. Unlike kieselguhr, a magnesium carbonate of exactly the same purity and properties can be easily produced from any raw materials whatever. Furthermore the great difficulties which are caused by the impurities in kieselguhr, such as iron, aluminium, organic substances and the like, are absent.

Furthermore, it is of particular advantage to work up spent catalysts produced on magnesium carbonate. The paraffin deposited on the catalysts is first removed in the customary manner by extraction with solvents. Thereupon the catalyst mass is broken up, cold water is poured over it and it is then treated with carbon dioxide. This causes all the magnesium

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to dissolve readily as bicarbonate, and by simple filtration in the cold state the liquid is quantitatively divided up into a solution of magnesium on the one hand and into a residue containing the metal catalysts on the other. It is possible to relieve the solution of magnesium bicarbonate again of part of the carbon dioxide by boiling or by blowing steam into it. This causes the magnesium to precipitate out completely as basic carbonate.

The residue containing the metal catalysts is dissolved in nitric acid in the usual manner, and the metal catalysts are precipitated afresh with alkaline precipitating agents. If, for example, cobalt catalysts containing magnesium and thorium are to be employed for benzine synthesis, which catalysts, after exhaustive investigations by the Applicants, have proved themselves to be far superior to the catalysts known for the catalytic conversion of carbon monoxide and hydrogen, a particular quantity of magnesium is added for activating purposes directly to the metal salt solution. In this case the dissolving of the magnesium carbonate with carbon dioxide need not be carried out quantitatively up to the extreme limit. The magnesium carbonate remaining in the residue is then dissolved with the other metals by means of acids, and the dissolved magnesium is precipitated at the same time as the metals cobalt and thorium are precipitated.

Further, the use of the carrier masses according to the process of the invention is particularly advantageous by reason of the fact that to dissolve them it is not necessary to use any further chemicals apart from the cheap carbon dioxide which is available in large quantities as waste gas, and which furthermore can be used in circulation. Unlike kieselguhr, the magnesium can be used as frequently as desired so that there is practically no loss in carrier mass. Furthermore no foreign substances are taken into the catalyst or into the solution from which the catalyst is precipitated. As raw material for the magnesium compounds used as carrier mass may be used the natural magnesium carbonates which occur in inexhaustible deposits or the magnesium salts occurring in salt deposits, for example also magnesium chloride.

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 producing iron group catalysts suitable for effecting benzine synthesis from oxides of carbon and hydrogen, characterised by the use of magnesium carbonates as carrier mass.

2. A process according to claim 1, characterized in that the magnesium compounds employed as carrier material are dissolved out from the spent catalyst mass by treatment with water and carbon dioxide, whereupon the magnesium solution separated from the insoluble residue is relieved of part of the carbon dioxide by boiling or by the blowing in of steam, and the magnesium is precipitated as basic carbonate.

Dated this 28th day of October, 1938.

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