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CATALYSTS FOR THE DECOMPOSITION OF HYDRAZINE AND ITS DERIVATIVES, AND A METHOD FOR ITS PRODUCTION

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16. Abstract

Catalysts of various types are used to decompose hydrazine and its derivatives. One type of catalyst is made as follows: the aluminum is dessolved out of an alloy of cobalt or nickel and aluminum so that a structure is produced that is chemically active for the monergol mentioned at the outset and that has a large active surface. The objective of this invention was to avoid these difficulties and to create a catalyst that not only has a short start time but that can also be manufactured easily and relatively inexpensively.

The solution to this task proposed by this invention is to coat the base structure of the catalyst with oxides of copper, cobalt and cerium or oxides of copper, cobalt and cerite earh.

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Catalyst for the decomposition of hydrazine and its derivatives, and method of manufacturing it.

Catalysts of various types are used to decompose hydrazine and its derivatives. One type of catalyst is made as follows: the aluminum is dissolved out of an alloy of cobalt or nickel and aluminum so that a structure is produced that is chemically active for the monergol mentioned at the outset and that has a large active surface. These catalysts have the disadvantage that in the cold state they have a long start time, i.e. it takes a long time for complete hydrazine decomposition to occur or for the complete capacity to be reached. The so-called precious metal catalysts do not suffer this disadvantage, but they are very expensive to manufacture; plus the /3 fact that it is not always possible to obtain the required precious metals in relatively large quantities on the world market and sometimes they are difficult to obtain at all.

The objective of this invention was to avoid these difficulties and to create a catalyst that not only has a short start time but that can also be manufactured easily and relatively inexpensively.

The solution to this task proposed by this invention is to coat the base structure of the catalyst with oxides of copper, cobalt and cerium or oxides of copper, cobalt and cerite earth.

The preparation of this type of coating on the base structure of the catalyst is carried out as follows: the base structure is wetted with an aqueous solution of the following composition:

approx. 40% by weight copper nitrate,
approx. 40% by weight cobalt nitrate and
approx. 20% by weight cerium nitrate.

Other compositions of aqueous solutions can be made from approx.

27% by weight copper nitrate,
63% by weight cobalt nitrate and
10% by weight thorium nitrate,

or

27% by weight copper nitrate,
63% by weight cobalt nitrate and
10% by weight ceric nitrate.

Instead of the above-mentioned (in the first example) cerium nitrate, /4
in the last case cerite earth is used, with

45 to 50% by weight cerium,
20 to 25% by weight lanthane,
15 to 20% by weight neodyme
5% by weight praseodyme
5% by weight samarium.

According to this invention, the coating of the base structure with the oxides mentioned is done by dipping the base structure once or several times into one of the nitrate solutions described; after dipping, or after each dipping, the oxides are formed by means of nitrate decomposition at a minimum temperature of 200°C. The maximum temperature that can be used is the annealing temperature, which is about 600°C. As a result of this treatment spinels are formed on the surface of the catalyst base structure which consist of the metal oxides that form and which cause spontaneous decomposition of the hydrazine or a hydrazine derivative when the catalyst is used. In addition the coating prepared according to this invention adheres well to the base structure of the catalyst and has a high temperature stability. The longer reaction capacity or life of this coating depends on the number of dippings, so that the life of the prepared catalyst can be specifically determined by this measure.

In order to obtain a large active surface, fiber metals, e.g of chrome-nickel steel, can be used as the base structure. There is also the possibility of using, for a base structure with many apertures, non-rusting metal bands or sheets of any desired shape which can be formed or expanded to form a kind of perforated screen /5 over its entire surface. Another base structure that can be used is a skeleton catalyst that is made by alkaline dissolving-out of aluminum from, for example, a cobalt or nickel/aluminum alloy.

The use of this catalyst makes it possible to achieve the spontaneous reaction properties that previously were possible only with an expensive and difficult form of preparation, relatively easily and inexpensively.

In addition, by using this "mixed catalyst", not only hydrazine and its derivatives but also the monergols hydrazine-water and hydrazine-methanol mixtures, such as are used in gas generators, can be decomposed.

Patent claims /6

1. Catalyst for the decomposition of hydrazine and its derivatives, characterized by the fact that its base structure is coated with oxides of copper, cobalt and thorium or oxides of copper, cobalt and cerium, or oxides of copper, cobalt and cerite earths.

2. Catalyst characterized by the fact that the following aqueous solution is used to prepare the coating according to claim 1:

   approx. 40% by weight copper nitrate,
   approx. 40% by weight cobalt nitrate and
   approx. 20% by weight cerium nitrate,
   which is used to wet the base structure.

3. Catalyst characterized by the fact that the following aqueous solution is used to prepare the coating according to claim 1:

   approx. 27% by weight copper nitrate,
   approx. 63% by weight cobalt nitrate and
   approx. 10% by weight thorium nitrate,
   which is used to wet the base structure.

4. Catalyst characterized by the fact that the following aqueous solution is used to prepare the coating according to claim 1:

approx. 27% by weight copper nitrate,
approx. 63% by weight cobalt nitrate and
approx. 10% by weight ceric nitrate,
which is used to wet the base structure.

5. Catalyst made according to claim 4, characterized by the fact that the cerite earth in the aqueous solution has the following composition: /7

45 to 50% by weight cerium
20 to 25% by weight lanthane
15 to 20% by weight neodyme
5% by weight praseodyme
5% by weight samarium.

6. Catalyst made according to claim 1, characterized by the fact that the base structure is dipped once or several times in a solution prepared according to the data in claims 2 through 5 and after dipping or after each dipping is exposed to a temperature of at least 200°C.

7. Catalyst made according to claim 6, characterized by the fact that the maximum treatment temperature that can be used is the annealing temperature, which is about 600°C.

8. Catalyst made according to claims 1 through 7, characterized by the fact that fiber metals, e.g. made of chrome-nickel steel, are used for the base structure.

9. Catalyst made according to claims 1 through 7, characterized by the fact that the base structure used consists of non-rusting metal bands or sheets of any shape and provided with many holes, shaped or stretched to form a kind of perforated screen over the entire surface.

10. Catalyst made according to claims 1 through 7, characterized by the fact that the base structure used is an ordinary catalyst that has been produced by alkaline dissolving-out of aluminum, made for example from a nickel-aluminum alloy. /8