Cl 260

Published Apr. 20, 1943

Serial No. 382,947

ALIEN PROPERTY CUSTODIAN

ARTIFICIAL MATERIALS AND THE METHODS OF PRODUCING THE SAME

Hans Bergk, Krefeld, Germany; vested in the Alien Property Custodian

No Drawing. Application filed March 12, 1941

This invention relates to improvements in artificial materials and the methods of producing the same, and more particularly to such materials produced from condensation and polymerization products obtained from dialdehydes and diamines.

An object of this invention is to produce an artificial material in an entirely novel manner.

Another object of this invention is to produce an artificial material having an unusually high resistance to high temperatures.

Still another object of this invention is to produce an artificial material which is practically insoluble in most of the usual solvents.

The methods and products of the present invention is based upon the condensation of dialdehydes and diamines of the type OCH—R^1—CHO and NH_2—R^2—NH_2, in which R^1 and R^2 can be bivalent, the same or different aromatic or aliphatic radicals, which may also contain nitrogen, sulphur or oxygen atoms. The condensation product is then further condensed or polymerized to large molecules. The reaction takes place according to the following formula:

$$\underset{\text{I}}{\text{OCH—}R^1\text{—CHO}} + \underset{\text{II}}{\text{NH}_2\text{—}R^2\text{—NH}_2} \rightarrow \underset{\text{III}}{\text{OCH—}R^1\text{—C=NH—}R^2\text{—NH}_2}$$

whereln III can again react with the same molecules, or molecules of types I or II for the formation of a large molecule chain. The condensation product is condensed or polymerized either immediately or in one or more later steps.

The original substances can be dissolved in a solvent such as alcohol and then brought together for the purposes of the reaction. In this case after some standing a body is precipitated which is practically insoluble in most of the usual solvents. On the other hand, the use of a solvent for the substances is not mandatory, as the reaction will take place instead by the heating of the reaction mixture.

The polymerization itself takes place very easily. It can be accelerated by heating or retarded by cooling, for example at −6° C. In the case of the above method in which alcohol is used as a solvent, the precipitated product may be filtered off therefrom without difficulty. By the addition of heat this filtered off product as well as also the product produced without any solvent may be brought into a plastic condition by raising the temperature. Upon a still further increase in temperature the substances will again become hard. The final degree of polymerization may be influenced by the addition of such substances which will satisfy the group standing at the end and capable of reaction. Such substances can be, for example, combinations of the type I or type II previously mentioned, or amines, ammonia, aldehyde, acids or acid chloride and similar bodies.

As examples of the foregoing method, and the product which can be obtained, attention is called to the following:

Example 1

A cold-saturated alcoholic solution is made of one molecule of terephthalaldehyde and another of one molecule of phenylenediamine. The two solutions are poured together and subjected to an ice cooling. After a short time a yellow body is precipitated. This body can be easily further polymerized immediately, by heating or by allowing same to stand at normal temperatures or the polymerization or condensation can be delayed by cooling it together with the alcohol to a very low temperature, for example −6° C. This first precipitated product is then held for several weeks. By the use of a higher temperature a further polymerization or condensation is then produced, and in this case the body changes color from yellow to brown. This body has a softening point at a temperature of approximately 200° C; upon further heating, however, it again becomes firm and is practically insoluble in most of the usual solvents. Furthermore, the body has an extremely high resistance against burning. The body is, however, soluble if cooked for a long time in a concentrated acid or alkali, and will change color from yellow to a bright orange.

Example 2

A second example is identical with example 1, except in this case a molecule or benzidine is used instead of the molecule of phenylenediamine. The body obtained will have the same characteristics as example 1, except that its color will change from yellow to a bright red if cooked in a concentrated acid.

The artificial material produced can be brought into the desired form by the application of heat or pressure or by a mechanical working. It may be then stabilized either by a sudden cooling or by the application of high heat.

HANS BERGK.