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POLYMERIZATION OR POLYCONDENSATION PRODUCT AND THE METHOD FOR PRODUCING THE SAME

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This invention relates to a Polymerization or polycondensation product and the method for producing the same, and more particularly to such a product which ineludes a bridge of two or more adjacently lying nitrogen atoms.

An objeet of this invention is to produce a new type of group of polymerization products whieh is particularly well adapted for the production of different types of artificial products.

Another object of this invention is the production of a suitable inorganic polymerization product capable of being formed into various artificial products.

Generally speaking, this invention relates to the production of materials of the group including polyhydrazides, polyhydrazones, polymeric azo compounds, polyhydrazo compounds, polyazoxy compounds, and further poly-condensates which must be designated as oxy-hydrazides, polydiazoamido compounds and similar classes of compounds as polyhydrazidine.

More specifically, the invention relates to the production of poly-condensation or polymerization products which involve reacting compounds of the di-carbonyl group with hydrazine or its compounds and then polymerizing the reaction product. Since di-carbonyl groups may include, for example, acids such as dicarboxylic acids or their derivatives, especially chloride, anhydrides and esters, and also di-aldehyde and diketone. Dicarboxylic acids will react, for example, with hydrazine to produce hydrazone. The resulting product can be polymerized to form an artificial product capable of forming plastic substances, films, fibers and the like, and, depending upon the final end product desired, may also be supplementarily treated. In this connection, the following supplementary treatments are contemplated:

The polymerized reaction product can be reduced into its corresponding polyazo-compounds; the polymerized reaction product can be hydrogenized into its corresponding polyhydrazio-compounds; the polymerized reaction product can be oxidized into its corresponding polyazoxy-compounds, the polymerized reaction products can be treated with ammonia to produce the corresponding polyhydrazidine.

The actual polymerization step may be varied in various ways known to the art. The polymerization can be effected by the action of raised temperature while the product is subjected to a vacuum. The polymerization can be stabilized at the desired stage by discontinuing the temperature elevation as, for example, by subjecting the product to a cooling action. The polymerization may be brought to a desired end point by adding an excess of one of the reaction constituents either at the beginning or during the course of the reaction, while an acceleration or delaying action upon the course of the reaction itself or upon the polymerization can be exercised by the addition of foreign materials, such as acids, basis, or salts.

The water or alcohol produced during the reaction can be removed by the use of the principle of the binary or ternary steam mix.

The produced intermediate product can be subjected to the usual dry spinning process either in a fused state with or without the addition of solvents or softening means or can be subjected to a wet spinning process in suitable solvents or thinning material with or without the addition of softening materials and other materials favorably influencing the spinning process. To the intermediate product there also may be added matting means or coloring material in solvent or pigment form before or during the course of the forming.

In mentioning above that di-aldehyde or diketone may be reacted with hydrazine, attention is directed to the fact that bisulphite compounds of such di-aldehydes or diketones are specifically contemplated. Also, while hydrazines have been mentioned, suitable hydrazine hydrates or their salts may also be used.

The following examples will indicate the manner in which the method according to the present invention is effected and the type of product produced thereby:

Example 1

128 parts of adipinic acid anhydride and 50 parts of hydrazine hydrate are brought together. A violent reaction takes place after the conclusion of which the reaction product is heated for five hours to 150° C. The resulting reaction product which is a white body insoluble in the usual solvents is then converted by heating in a vacuum to 290° C. into a high polymeric compound. The polymerization product obtained is capable of being drawn into fibers and can either be spun into threads by means of a constant volume pump through interposed nozzles, or can be shaped by the use of pressure.

Example 2

286 parts of hexadecane dicarboxylic acid is heated with 50 parts of hydrazine hydrate for ten hours with the use of a reflux condenser until complete decomposition takes place. After

the removal of the hydrate-and reaction water, the reaction product is further treated in a vacuum at approximately 200° to 300° C. After approximately three hours of heating one receives a polymerization product which has similar characteristics as in example 1, and which can be treated in a similar manner to produce artificial products or fibers.

The fibers obtained by the methods according to this invention are characterized by extraordinarily high elasticity and strength, and have such a high fusion point that they are useful with advantage for textile and technical purposes.

While various processes for the production of various artificial material have been heretofore known to the art, it is believed that for the first time there is here disclosed a method for producing what may be termed an inorganic artificial material.

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