

ALIEN PROPERTY CUSTODIAN

POLYMERIC PRODUCTS AND THE METHOD FOR PRODUCING THE SAME

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This invention relates to polymeric products and the method for producing the same.

An object of this invention is the production of polymeric products by a novel manner.

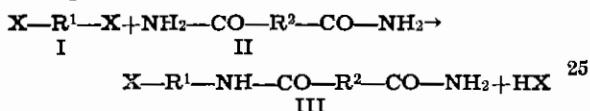
Another object of this invention is the production of a novel polymeric product.

A further object of this invention is the production of polymeric products from relatively stable substances.

A more specific object of this invention is to produce a polymeric product from the polymerization of acid amides with di-halides.

Acid amides themselves may be very easily produced in several ways, for example, from di-esters and aqueous ammonia, or from acid chloride likewise by reaction with aqueous ammonia. The halides are likewise easily produced in many ways which are known to the art.

In suitable combinations, di-halides of the type $X-R^1-X$ combine with acid amides of the type $NH_2-CO-R^2-CO-NH_2$, according to the following reaction:



In this equation:

$X = Cl, Br, I,$

$R^1 =$ Aliphatic, aromatic or cyclic residue with straight or branched chains, and

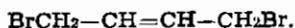
$R^2 =$ A bi-valent radical which may be of the type similar to R^1 .

The halogen may either be at the end of the chain, for example, $BrCH_2-(CH_2)_4-CH_2Br$, or in the middle, for example,



The chain may consist only of C-atoms but also may contain oxygen, sulphur or nitrogen bridges.

The chains or the side chains can also contain double bonds, for example



The radical R^1 can contain atoms or atom groups which facilitate the splitting off of the halogen atom.

The product III can either be reacted with itself or with I and II for the formation of a larger molecular chain.

The reaction can be substantially accelerated if a catalyst, for example, alkaline oxide, hydroxide or carbonates, or basic organic substances, aluminum chloride or zinc chloride are added to the reaction mix.

An additional possibility for accelerating the reaction is by the removal of the hydrogen halides

which become free during the reaction. Also an acceleration may be effected by a raising of the temperature of the mix as well by changing the pressure. The temperature should be so chosen that no decomposition of the amides will result, since, for example, in the case of adipinic acid diamides, this may happen if the mix is heated for a long time even beneath the melting point. It is best for the purposes in mind to exclude all oxidizing substances, so that the atmospheric hydrogen can be replaced by nitrogen. If it is desired to decelerate the reaction or bring it to a standstill this can be done by the removal of the catalyst in addition to the maintenance of a lower temperature, so that in the case of a supplemental heating which is necessary for a further working of the material, no further polymerization can arise.

A further advantage of the method according to this invention lies in the fact that polymerization can also be stopped by raising of the temperature of the mix and at the same time adding materials which are designed to saturate the end groups. Such materials can be combinations of the type I or type II, or materials which react with the end group, such, for example, as amides, acid chlorides and the like.

As specific examples of the method and product formed in accordance with this invention, attention is directed to the following:

Example 1

One molecule of 1,6 dibromo-n-hexane and one molecule of adipinic acid diamide are brought into solution or into the finest suspension in 2500 cubic centimeters of benzene by an extremely rigorous agitation. Being careful to exclude hydrogen and atmospheric oxygen, one adds 50 grams of the most finely pulverized aluminum chloride together with oxygen-free nitrogen. When it is desired to separate the aluminum chloride, the reaction mix can be poured into vigorously agitated water so that a minute separation and complete removal of the aluminum chloride is effected.

Example 2

One molecule of adipinic acid diamide and one molecule of dibromo butadiene are heated in an autoclave in the presence of hydrogen at 180°C until a body of the desired plastic property arises. Viscosity can then serve as a measure of this desired plasticity. The hydrogen bromide which will arise can be removed from the reaction mix by proper amount of caustic soda.

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