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PRODUCTION OF MOLECULAR COMPOUNDS

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This invention relates to a new composition of matter formed of molecular quantities of urea and mono-, di- and poly-saccharoses; further, to a process of producing such molecular compounds, to improving agents for textiles, such as finishing agents, sizes, weighting agents, etc. comprising such molecular compounds, and to textiles treated therewith.

It has been proposed already to use ureas for purposes of the textile industry. For example, British Patent No. 251,993 discloses the employment thereof for finishing. British Patent No. 285,992 and French Patent No. 658,658 describe the use of urea as a swelling agent for artificial silk, particularly acetate silk, and British Patent Nos. 318,978; 318,469 and 262,830 recommend additions of urea to dye-baths.

According to these disclosures, urea can be used also in the presence of other compounds, and on examination it will be found that such other substances are to be added in quantities not narrowly proportionate to the urea used. They constitute therefore pure mixtures, and it was justifiable to expect that they would disclose merely the properties of their various components.

American Patent No. 1,979,121 showed, however, that molecular compounds of urea and inorganic or organic salts possess properties not disclosed by the components as such and of a nature to render these compounds excellently suitable for finishing purposes. The urea and salt compounds of the general formula



described in detail in the specification mentioned, in contrast with urea, are distinguished by being, as a rule, highly hygroscopic and therefore difficult to crystallize. As a result thereof there is no danger of efflorescence on the fabric or that they will fly off like dust or cover the colors, even if applied in higher concentrations to attain for instance advantageous weighting besides good finishing.

It is further known to employ in the textile industry sugar of various kinds, such as grape sugar, cane sugar, etc., for imparting to fabrics greater stiffness and more feel. Sugar, however, can be used only within relatively narrow limits, because if applied in larger amounts to the fiber the colors of the textiles will often appear lightly covered thereby and the sugar may come off in dust-like particles. Furthermore, this loading with sugar frequently imparts to the fabric an unpleasant sticky feel and causes its rejection by users.

According to the invention, these drawbacks can be avoided by employing molecular compounds of urea and saccharoses.

These molecular compounds of urea and a mono-, di- or poly-saccharose represent new chemical compounds having a uniform relatively sharp melting point. Like most molecular compounds they possess the chemical properties of their components, but disclose a considerably different physical behavior. Their solubility conditions in particular are different, as they usually dissolve more easily in water and crystallize much more difficultly. A remarkable feature of compounds from such solutions is their low adhesive power.

Compounds of this class can be obtained in a simple manner by dissolving the components in each other and heating to liquefaction, i. e., by fusing urea in equimolecular or double equimolecular quantity with respect to the saccharose, or by evaporating a solution of both in a suitable solvent like water, methyl alcohol, etc. on the water bath and heating the residue up to melting. In most cases the temperature of the water bath will be sufficient, though higher temperatures may be useful, especially to insure rapid conversion of the components. According to the kind of saccharoses employed, the time required for conversion differs slightly, though those skilled in the art will have no difficulty in finding out when the conversion is completed.

Saccharoses practically suitable for conversion with urea on account of being available in sufficient quantities are for instance 4- and 5-hydroxyl aldehydes and ketonic alcohols like arabinose, glucose, galactose, levulose as monosaccharides. Of the di-saccharoses, cane-sugar, lactose and maltose may be mentioned; and of the polysaccharoses, raffinose. Mixtures of these can of course be used also.

These molecular compounds crystallize so difficultly that crystallization can be brought about only by resorting to measures like precipitating with alcohol, rubbing with a glass rod and inoculating the fused mass when cold with a small crystal. Identification was effected by the inventor in crystallized material only.

This low crystalline force renders such molecular compounds particularly suitable for finishing purposes, and finishing agents comprising them are therefore of great practical importance. Whilst it has frequently been observed that the separate use of the components or of any non-equimolecular mixtures causes crystallization on the fiber, the employment of the compounds men-

tioned is not open to the same objection. It is even possible to load the textiles with larger quantities without causing efflorescence. Furthermore, since the application of agents comprising such molecular compounds makes it possible to avoid the viscosity of sugar preparations, stickiness cannot appear at all or only to a very slight degree, even in case of high concentrations on the fiber in typical weighting finishes. Compared with other agents like glycerin, the compounds described are less hydrophilic, which is highly desirable, as a fiber loaded for instance with 10% to 20% glycerin, etc. from treating agents discloses such differences in weight depending on atmospheric moisture that trading in such goods and especially passing them through the customs is made extraordinarily difficult. On the average, the new finishing agents based on such saccharose-urea molecular compounds can absorb only about one-fourth of the amount of water absorbed by glycerin under the same conditions. The stability in weight attained thereby is even somewhat greater than that achieved by means of compounds according to the American Patent No. 1,979,121.

A further considerable advantage afforded by using such agents as additions to finishing agents is that they form stable mixtures with most known finishing additions and agents of a different or similar type. It is therefore possible to employ them in the presence of glue, gelatin, starch, mucilages, etc., and even sensitive softening agents do not produce a reaction with the highly indifferent molecular compounds. Many different combination effects can thus be obtained, which is of considerable importance in the finishing of textiles.

The following examples are intended to explain the nature of the invention without limiting it to the disclosures made therein.

Example 1

The molecular compound of urea and glucose is obtained by fusing 60 parts by weight of urea with 198 p. b. w. of finely pulverized dry glucose at water bath temperature. The syrup obtained in about one hour normally does not tend to crystallize. Only when the syrup is left standing for some time and subjected to occasional rubbing with a glass rod, small needles will separate therefrom, whereupon the largest portion of the mass soon solidifies from the center of crystallization and forms a crystal-magma. For identification application to clay is preferable. The isolated little needles melt at 117° C. after drying on calcium chloride; glucose is known to melt at 85° C. and urea at 132° C. The relatively sharp melting point is characteristic of the molecular compound.

Example 2

Viscose silk on the reel is treated with a liquor containing in 100 liters of water 10 kg. of a molecular compound according to Example 1, whereupon the goods are hydro-extracted and dried as usual. Material thus finished discloses an excellent feel, and its stability as to weight is good.

Example 3

Pure wool gaberdine is passed on the padding machine through a liquor containing 3% of ordinary commercial paraffin and of a single bath impregnating agent containing alumina, to which furthermore 15% of a molecular compound of 1 mol. of urea plus 1 mol. of cane sugar has been

added. The after-treatment of the goods is as usual. The finished material has a full feel, sheds water well and after treatment increases 12% in weight.

Example 4

The rear side of fancy cotton goods is treated with a finishing liquor containing in 100 parts of water 5 parts by weight of soluble starch and 20 p. b. w. of a molecular compound of 1 mol. of urea and 1 mol. of glucose by spraying. The remainder of the treatment is the usual one. The material obtained is highly weighted, but does not feel sticky, and even at considerable differences in atmospheric moisture fluctuates in weight only within permissible limits.

I claim:—

1. As a new composition of matter the molecular compound containing carbamide and saccharoses as components in molecular proportion up to 2:1, and disclosing the chemical properties of the said components, but having lower crystalline force than each of said components and less adhesive power than sugar in the form of more highly concentrated solutions.
2. As a new composition of matter the molecular compound of 1 molecule carbamide and one molecule glucose, said compound melting at 117° C.
3. The process consisting in dissolving molecular quantities of urea and of saccharoses into one another in molecular proportions up to 2:1 while heating up to liquefaction.
4. The process of producing novel molecular compounds, consisting in dissolving urea and glucose in molecular quantities up to a 2:1 ratio into one another at water bath temperature.
5. The process of producing novel molecular compounds, consisting in dissolving urea and saccharoses in molecular quantities up to a 2:1 ratio into one another in the presence of a solvent.
6. The process of producing novel molecular compounds, consisting in dissolving urea and saccharoses in molecular quantities up to a 2:1 ratio into one another by evaporation of a common aqueous solution and heating the residue on the water bath.
7. As finishing agents for textiles, comprising molecular compounds of carbamide and saccharoses in a molecular ratio ranging between 1:1 and 2:1.
8. A molecular compound of carbamide and saccharose components containing up to 2 molecular parts of the former component to one of the latter, exhibiting the chemical properties of said components, but sharply distinguished from both components in respect to a fixed melting point.
9. A molecular compound of carbamide and saccharose components containing up to 2 molecular parts of the former component to one of the latter, exhibiting the chemical properties of said components, but distinguished from the latter component by a low property of adhesion.
10. A molecular compound of carbamide and saccharose components containing up to 2 molecular parts of the former component to one of the latter, exhibiting the chemical properties of said components, but distinguished from both components in respect to sluggishness in crystallization, i. e. crystallization takes place only, when started by introduction of a foreign agent.
11. A molecular compound of carbamide and saccharose components containing up to 2 molecular parts of the former component to one of

the latter, exhibiting the chemical properties of said components, but distinguished from both components in respect to ready solubility and a high capacity of being over-saturated in solution.

the latter, exhibiting the chemical properties of said components, but distinguished from both components in respect to a low hygroscopicity.

5 12. A molecular compound of carbamide and saccharose components containing up to 2 molecular parts of the former component to one of

13. A molecular compound of addition of like molecular parts of urea and cane sugar.

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