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PROCESS FOR PRODUCING CRIMPED FILAMENTS

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ABSTRACT OF THE DISCLOSURE

A process for producing a crimped filament in which there are melt conjugate-spun, first and second constituents, to form a composite filament, the first constituent consisting essentially of a polyamide selected from the group consisting of nylon 6, nylon 66 and nylon 610, and the second constituent consisting essentially of the same polyamide with 1 to 10% by weight of glycerin incorporated therein. The resulting filament is cooled and stretched and thereafter treated with water to develop crimps therein.

This invention relates to a process for producing crimped composite filaments comprising polyamides. More particularly, the invention pertains to a method for preparing crimped composite filaments by the conjugate-spinning of a polyamide incorporated with glycerin and the same polyamide containing no glycerin.

Conventional methods for the production of crimped filaments are roughly divided into two groups; one is a method in which filaments are mechanically crimped and then the crimps are subjected to heat-setting, and the other is a method in which filaments are crimped by being brought into a bilateral structure. It is thought, however, that the latter method gives more natural crimps. Particularly, in the case of long filaments, crimps are developed, if necessary, after the filaments have been formed into products such as fabrics or textures and therefore it is considered that the latter method is effective for such filaments. Such latently crimpable filaments (conjugate-spun composite filaments of the type developing no crimps unless they are subjected to heat-treatment in a non-tensioned state after stretching, will be referred to as latently crimpable filaments, hereinafter) are formed by subjecting two kinds of polymers to conjugate-spinning. In this case, the two constituent polymers are required to be similar in chemical structure and crystal structure. If the two constituents are different in chemical structure and crystal structure, there is brought about such a drawback that the resulting composite filament may be separated. It is, however, needless to say that no crimps are developed if the two constituents are entirely the same polymers. For the above reasons, the conventional methods utilize two kinds of polymers, e.g., homopolymers such as nylon 6 and nylon 66 or nylon 610, or copolymers thereof. Thus, the conventional methods require the preparation of two kinds of polymers and hence are inconvenient to be practiced on a commercial scale. Moreover, the conventional methods suffer from the drawback that the time to develop crimps is difficulty controlled.

An object of the present invention is to provide a process for producing latently crimpable composite filaments which can be practiced economically and can easily control the resulting crimps.

In accordance with the present invention, one component employed is a polymer mixture prepared by incorporating 1 to 10% of glycerin into a starting polymer, e.g. a polyamide such as nylon 6, nylon 66 or nylon 610, and the other component is the same polymer as above in which no glycerin has been incorporated. Using a conjugate-spinning machine provided with, for example, a side-by-side type spinneret, the above two components are subjected to melt conjugate-spinning to form a bilateral structure and the resulting filament is stretched. The obtained filament is treated with water or hot water and the glycerin contained in the one of the constituents is dissolved out, whereby a structural difference between the two constituents is brought about to give crimps to the filament. In case the filament is further subjected to heat treatment, after the treatment with water or hot water to dissolve out glycerin, the crimps of the filament become even better. It is considered that in the above case, the crimps are developed for the reason that glycerin acts as a solvent for polyamides and, in cooling and crystallizing, the polyamide containing glycerin is made different in behavior from the polyamide containing no glycerin to form a bilateral structure which, when the glycerin is dissolved-out by treatment with water or hot water, is further intensified to develop crimps. In this instance, in case the amount of glycerin added is more than 10%, the effect of glycerin as a solvent becomes excessive whereby the polyamide is lowered in viscosity and is deteriorated in spinnability to form no filament, in some cases. In case the amount of glycerin is less than 1%, the crimp-developing effect is lowered and the homogeneous mixing of glycerin and polyamide becomes difficult to lower the uniformity of the resulting crimps.

In accordance with the present invention, the starting polymer is only one kind of polymer, and therefore the invention is advantageous in the supply of starting materials. Further, the invention gives the advantage that since crimps are developed by treatment with hot water, no crimps are substantially developed after the stretching of the filament, and crimps can be easily developed, at any time whenever these are desired to be formed, by hot water treatment preferably followed by heat treatment.

The invention will be illustrated further in detail with reference to the following examples:

Example 1

In this example, one constituent employed was nylon 6 and the other constituent was prepared by incorporating 5% by weight of glycerin into nylon 6. Using a conjugate-spinning machine provided with a known side-by-side type spinneret, the above two constituents were melt-extruded in a ratio of 1:1 at an extrusion temperature of 275° C. The resulting filament was cooled and was stretched to 4.0 times in air to obtain a latently crimpable filament having a tenacity of 4.2 g./d. and an elongation of 20%. This filament was treated with hot water at 80° C. for 30 minutes to dissolve out glycerin and was then dried in air. The obtained filament was an excellent crimped filament having 32 crimps per inch.

Example 2

In this example, one constituent employed was nylon 66 and the other constituent was prepared by incorporating 10% by weight of glycerin into nylon 66. In the same manner as in Example 1, the above two constituents were subjected to conjugate-spinning and the resulting filament was stretched to obtain a latently crimpable filament having a tenacity of 4 g./d. and an elongation of 22%. This filament was treated with water for one hour to dissolve out glycerin and was then dried in hot air at 100° C. The obtained filament was an excellent crimped filament having 46 crimps per inch.

Example 3

In this example, one constituent is nylon 610 and the other constituent was prepared by incorporating 10% by weight of glycerin into nylon 610. In the same manner as in Example 1, the above two constituents were subjected

to conjugate-spinning and the resulting filament was stretched to obtain a latently crimpable filament having a tenacity of 4.2 g./d. and an elongation of 20%. This filament was treated with water for one hour and was then dried in air. The obtained filament was an excellent crimped filament having 21 crimps per inch.

What we claim is:

1. A process for producing a latently crimpable linear polyamide product which comprises melt conjugate-spinning first and second constituents to form a composite filament, the first constituent consisting essentially of a polyamide selected from the group consisting of nylon 6, nylon 66 and nylon 610 and the second constituent consisting essentially of the same polyamide with 1 to 10% by weight of glycerin, and then cooling and stretching the resulting composite filament.

2. A process according to claim 1 wherein the constituents are spun in side-by-side relation.

3. A process according to claim 1 wherein said constituents are melt-spun at a temperature of about 275° C.

4. A process for producing a crimped filament which comprises melt conjugate-spinning first and second constituents to form a composite filament, the first constituent consisting essentially of a polyamide selected from the group consisting of nylon 6, nylon 66 and nylon 610 and the second constituent consisting essentially of the same polyamide with 1 to 10% by weight of glycerin, cooling and stretching the resulting filament and then treating the filament with water to develop crimps therein.

5. A process according to claim 4 wherein the temperature of the water in which said filament is treated is 80° C.

6. A process according to claim 4 wherein the constituents are spun in side-by-side relation.

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