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METHOD FOR SETTING HAIR

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ABSTRACT OF THE DISCLOSURE

Improved methods for holding hair in desired forms and shapes, wherein the holding agent is a partial amide of a low molecular weight ethylenimine polymer.

BACKGROUND OF THE INVENTION

Preparations for setting waves or curls in hair are known. Most of such preparations have been based on sticky or mucilaginous substances, largely natural gums, because the latter are more readily prepared and applied. The natural gums do not have all the desired and required properties for a successful preparation to hold the hair in a desired form. They are usually not very effective in thin layers, lack adhesion, flake off, dry hard, turn white, discolor the hair and impart undesirable brittleness or stiffness. Some gums require an addition of alkali, which is not desirable. Other materials for holding the hair require alcohol as a solvent which is too drying for the hair and scalp. Gel-like compositions interfere with proper application.

SUMMARY OF THE INVENTION

It is an object of this invention to provide improved methods for holding hair in desired forms and yielding good feel, sheen, softness, appearance, combability, brushability, water resistance and static resistance achieved by the use of a normally water-soluble amide, the reaction product of (a) a polymer of one or more monomers having the formula

$$\underset{\llcorner\!\!\lrcorner}{NR^1—CHR^2CH_2}$$

wherein R^1 represents up to 50 mole percent of a 1 to 3 carbon alkyl or a 2 to 3 carbon hydroxyalkyl group, the balance being H, and R^2 represents H or CH_3, i.e., polymeric aziridine (ethylenimine), 2-methylaziridine, N-hydroxyethylaziridine, N-hydroxyethyl-2 - methylaziridine, N-ethylaziridine and the like polymers and copolymers, with (b) less than an equivalent amount of diketene sufficient to give a reversible gel in water at a temperature between about 45° and 60° C. Such reversible gel products and their preparation are disclosed in Jones, U.S. Pat. 2,587,329, patented Feb. 26, 1952. In effectuating the objects of this invention, a post-reactive water-soluble resin of the aforesaid type, i.e., such an amidated ethylenimine polymer or copolymer wherein the amidation is sufficiently less than equivalent with respect to the imino groups so as to give an aqueous composition which gels at room temperature, yet can be fluidized by raising the temperature to between 45° and 60° C., is applied to the hair and thereafter migrates into the hair wherein it is dried and set, advantageously under a conventional hair dryer after it has been set in the desired form.

DETAILED DESCRIPTION OF THE INVENTION

In the practice of this invention, an aqueous solution of a linear, i.e., uncrosslinked polyethylenimine resin, as previously described, advantageously having a concentration ranging between about 5 and 15 weight percent and having an average molecular weight ranging between about 500 and 10,000, and preferably between 500 and 2,000, is reacted with diketene in amount sufficient partially to amidate said ethylenimine polymer, the amount of diketene being added in amount sufficient to give a thermally reversible gel which solidifies at room temperature but can be liquefied by raising its temperature to one between about 45° and 60° C. Such a solution is applied to the clean hair, advantageously after shampooing, in amount sufficient to keep the hair wet while maintaining a temperature between about 45° and 60° C., advantageously for about 10 to 30 minutes. The longer application times are required when an amidation product of a higher molecular weight ethylenimine polymer than 2,000 and up to 10,000 is used, so as to permit penetration into the hair. After such treatment, the hair is rinsed to remove excess surface polymer. Excess water is removed by toweling, the hair is then shaped or set, advantageously by wrapping about rollers and clamped therein, and, after being allowed to set overnight or, advantageously, after equivalent drying under a hair dryer, the rollers are removed. A curl is thereby obtained.

The following examples describe completely representative specific embodiments and the best modes contemplated by the inventors of carrying out their inventive process.

EXAMPLE 1

Hair is kept saturated for about thirty minutes with a fresh solution of a polyethylenamide obtained by reacting 3 milliliter amounts of diketene with 60 gram amounts of a 10 percent aqueous solution of a linear polyethylenimine having an average molecular weight of 1200. After the treatment, the hair is rinsed in four fresh changes of water to remove excess surface polymer. Additional rinsing may be necessary if a softer curl is desired. The hair is then pressed between toweling to remove excess water. The hair is then wrapped in clamping rollers and clamped. After overnight setting, the rollers are removed. This treatment gives a desirable curl. If a softer curl is thereafter desired, the curled hair is rinsed again until the desired softness is obtained and is then dried.

EXAMPLE 2

The procedure of Example 1 is repeated, substituting in place of the polyethylenimine an equivalent amount, imide N basis, of a polymeric N-hydroxyethyl ethylenimine, an N-hydroxyethyl-2-methyl-ethylenimine, N-ethyl ethylenimine, 2-methyl ethylenimine, and 50/50 weight percent of the first named and the last named monomers, wherein hydroxyethyl and ethyl substitution amounts to 50 mole percent of the imide hydrogen, which polymers have a molecular weight ranging between 1200 and 5,000. Substantially similar results are obtained.

What is claimed is:

1. In a method for setting hair by applying to the hair an aqueous preparation for a time sufficient to hold the hair in a desired form, setting and drying said hair, the improvement which comprises applying to the hair is said method, at a temperature between about 45° and 60° C., an aqueous solution of about 5 to 15 percent of a water-soluble gel-forming amide resin, which resin is comprised of the reaction product of (1) a polymer of at least one monomer having the formula

$$\underset{\llcorner\!\!\lrcorner}{NR^1—CHR^2CH_2}$$

wherein R^1 represents up to 50 mole percent of a 1 to 3 carbon alkyl or a 2 to 3 carbon hydroxyalkyl, the balance being H, and R^2 represents H or CH_3, said polymer having an average molecular weight ranging between about 500 and 10,000 and (2) diketene in an amount less than equivalent with respect to the imino groups present in said polymer but sufficient to give a gel-forming resin

which is thermally reversible to give a fluid solution in water at a temperature between about 45° and 60° C.

2. The method of claim 1, which comprises impregnating said hair, for a time sufficient to hold the hair in a desired form and at a temperature between about 45° and 60° C., with a 10 percent aqueous solution of the amide resin reaction product of (a) a polymeric ethylenimine having a molecular weight ranging between 500 and 10,000 and (b) diketene in an amount less than equivalent with respect to the imino groups present in said polymer but sufficient to give a gel-forming resin which is thermally reversible to give a fluid solution in water at a temperature between about 45° and 60° C., thereafter rinsing the hair to remove excess surface resin, removing excess water from said hair, setting and drying said hair.

3. The method of claim 2 wherein the gel-forming resin is the reaction product of an aqueous solution of polyethylenimine having an average molecular weight of 1200 and diketene in the ratio of 6 grams of the imine to 3 milliliters of the latter.

References Cited

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