United States Patent Office 3,142,623 Patented July 28, 1964

3,142,623 PERMANENT WAVING OF HAIR AND ANALOGOUS PROCESSES

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No Drawing. Filed Nov. 22, 1961, Ser. No. 154,334
Claims priority, application France Nov. 15, 1961
10 Claims. (Cl. 167—87.1)

This invention relates to the so-called permanent waving of hair and more generally to the deformation of hair to a desired configuration.

Processes for deformation of hair which operate at room temperature, e.g. "cold" permanent waving, generally involve two successive operations, first a softening of the hair, which is effected by reducing the disulphide bonds of the keratin, the hair being brought to the desired configuration in the course of this softening, and secondly a hardening of the hair so that it is "set" in the desired configuration.

The second operation, i.e. the setting operation, involves careful and highly skilled work since the operator is working with hair saturated with a reducing liquid and wound on a curler.

In the known processes for the "cold" permanent deformation of hair, that is to say, without external application of heat, various reducing products have been proposed for the first operation, but in fact only reducing compounds which are mercapto compounds have had any substantial commercial success.

The setting operation can be carried out by oxidation, which simply reforms the disulphide bond, or by alkylation of the thiol groupings. The alkylation is preferably carried out with the aid of bifunctional compounds in order to restore the cross linkages. Many alkylation products have been proposed, including mono- or dihalogenated hydrocarbons, mono- or dialdehydes, olefinic derivatives such as acrylic ester or maleic acid derivatives, thiosulphuric esters and derivatives comprising two quaternary ammonium functions.

It has been proposed to include such compounds in permanent waving liquids containing a reducing agent, in order to effect the reduction and the setting in one operation. However, these so-called "self-neutralising" liquids, as hitherto proposed, have either contained reducing agents other than thiols, or have involved the use of techniques, such as heating under a hood and excessively long periods of application, which make it impossible to achieve the rapidity and simplicity which are desirable in the practical performance of cold permanent waving.

It is an object of the present invention to provide a new single-stage process for the cold permanent deformation of hair which meets the requirements for rapidity and simplicity in the practice of cold waving, and at the same time permits the use of a reducing agent having a mercaptan function. In addition, it gives a very lasting wave of outstanding quality.

According to the present invention there is provided a process for the permanent deformation of hair which comprises constraining the hair to a desired configuration, impregnating it at room temperature with a freshly prepared aqueous composition containing a thiol reducing agent of the general Formula I:

$$HS—CH_2—R \qquad (I)$$

in which R denotes a group imparting to the molecule of thiol a pK for the function —SH equal to or higher than 9.5, and a glycol dimethacrylate of the general Formula II:

$$CH_2=\underset{\displaystyle CH_3}{\overset{|}{C}}—CO—(OCH_2CH_2)_n—O—CO—\underset{\displaystyle CH_3}{\overset{|}{C}}=CH_2 \qquad (II)$$

where n is an integer 1 to 7 and thereafter rinsing the hair.

The group R in the foregoing general Formula I may be, for example a —COOH or —CH_2OH group. Thus suitable thiols are α-mercapto-acetic acid, α-mercapto-propionic acid, β-mercaptopropionic acid and mercapto-ethanol.

In a preferred method of carrying out the process of the invention, an aqueous solution of one of these thiols is mixed with ethylene glycol dimethacrylate, of the formula:

$$CH_2=\underset{\displaystyle CH_3}{\overset{|}{C}}—COOCH_2CH_2OCO—\underset{\displaystyle CH_3}{\overset{|}{C}}=CH_2$$

and the pH of this composition is adjusted to between 7 and 9, preferably 7.5 to 8.5, the hair is left in contact with the aforesaid composition for a time, preferably between 10 and 60 minutes and rinsed. The locks of hair, which will usually be on curlers may be unwound optionally after a period of rest.

According to a further feature of the invention there is provided a composition for use in the permanent deformation of hair, which comprises a reducing agent of the general Formula I set forth above, and a glycol dimethacrylate of general Formula II. More particularly the invention provides compositions as aforesaid in which the said substances are in an aqueous medium and the pH of the composition is from 7 to 9.

The pH of the composition according to the invention may be adjusted by the addition of an alkaline substance such as ammonia, an organic amine or an alkali salt of a weak acid.

The compositions according to the invention may in addition contain any of the adjuvants known per se for inclusion in permanent waving compositions, for example, wetting agents.

The following examples will serve to illustrate the invention, the percentages given being by weight:

Example 1

80 cc. of a solution having the following composition:

	Percent
Thioglycolic acid	10
NH_4OH	3.5
Ammonium bicarbonate	10
Water	76.5

is mixed with 20 cc. of an emulsion having the following composition:

	Percent
Ethylene glycol dimethacrylate	25
Tween 80 (wetting agent)	25
Water	50

Each lock of the hair wound on curlers is carefully impregnated with the resultant solution and left in contact therewith for 30 minutes under a hood. After ample rinsing, the hair is allowed to stand for 5 minutes and the locks are unwound. The hair is then combed and adjusted to a desired hair-style and the hair is then dried. A fine permanent wave of outstanding quality is obtained.

Example 2

80 cc. of a solution having the following composition:

	Percent
Thioglycolic acid	10
Ammonia	3.5
Ammonium bicarbonate	10
Water	76.5

is mixed with 20 cc. of an emulsion having the following composition:

	Percent
Diethylene glycol dimethacrylate	35
Tween 80 (wetting agent)	25
Water	40

Each lock of the hair wound on curlers is carefully impregnated with the resultant solution and left in contact therewith for 30 minutes under a hood. After ample rinsing, the hair is allowed to stand for 5 minutes and the locks are unwound. The hair is then combed and adjusted to a desired hair-style and the hair is then dried. A fine permanent wave of outstanding quality is obtained.

Example 3

80 cc. of a solution having the following composition:

	Percent
Thiolactic acid	11
Ammonia	3.5
Ammonium bicarbonate	10.5
Water	75

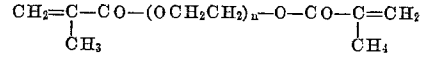
is mixed with 20 cc. of an emulsion having the following composition:

	Percent
Tetraethylene glycol dimethacrylate	40
Tween	25
Water	35

The mixture is applied in the same way as in the two preceding examples.

What we claim is:

1. The process for the permanent deformation of hair which comprises constraining the hair to a desired configuration, impregnating it at room temperature with a freshly prepared aqueous composition containing a thiol selected from the group consisting of thioglycolic acid, α-mercapto propionic acid, β-mercapto propionic acid and mercapto ethanol, and a glycol dimethacrylate of the formula:



in which n is an integer from 1 to 7 at a pH of 7 to 9, and thereafter rinsing the hair.

2. A process according to claim 1 wherein the glycol dimethacrylate is ethylene glycol dimethacrylate.

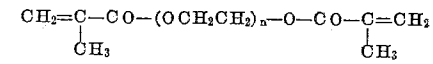
3. A process according to claim 1 wherein the glycol dimethacrylate is diethylene glycol dimethacrylate.

4. A process according to claim 1 wherein the glycol dimethacrylate is tetra-ethylene glycol dimethacrylate.

5. A process according to claim 1 wherein the pH of the composition is adjusted by adding thereto an alkaline substance selected from the group consisting of ammonia, an organic amine and an alkali salt of a weak acid.

6. A process according to claim 1 wherein the said composition is left in contact with the hair for 10 to 60 minutes.

7. A composition for use in the permanent deformation of live hair which comprises a thiol selected from the group consisting of thiolglycolic acid, α-mercapto propionic acid, β-mercapto propionic acid and a mercapto-ethanol, and a glycol dimethacrylate of the formula:



in which n is an integer from 1 to 7 and having a pH of 7 to 9.

8. A composition according to claim 7 wherein the glycol dimethacrylate is ethylene glycol dimethacrylate.

9. A composition according to claim 7 wherein the glycol dimethacrylate is diethylene glycol dimethacrylate.

10. A composition according to claim 7 wherein the glycol dimethacrylate is tetra-ethylene glycol dimethacrylate.

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