

Description

Process for semi-permanent straightening of curly, frizzy or wavy hair.

The present patent application for industrial invention relates to a process used to semi-permanently straighten curly, frizzy or wavy hair.

1. **Glyoxylic acid:** it is an alpha-keto acid that can be found in crystalline monohydrate form (CAS No.: 563-96-2) or in aqueous solution (CAS No.:
5 298-12-4).

Main synonyms: Formylformic acid; alpha-Ketoacetic acid; Glyoxalic acid; Oxalaldehydic acid; Oxoacetic acid; Oxoethanoic acid and others.

Its use in the cosmetic sector is considered safe and permitted without any restrictions with indication of the buffering agent function of the pH.

- 10 2. **Alpha-keto acids:** Alpha-keto acids are acids with a carbonylic group in alpha position with respect to the carbon atom of the carboxylic group.
3. **Semi-perm:** treatment of curly or frizzy hair to straighten it with permanence in such a condition for a number of washings higher than 5.
4. **Hair straightening iron:** Electrical heating device used in association with
15 a combination of heat and pressure to straighten hair. It is generally composed of two flat heating elements, covered with various materials, between which a lock of hair is pressed at a time. Hair straightening irons are commonly found on the market.
5. **Hairdryer:** ordinary hair-drying device with heating resistance and fan.
- 20 6. **Buffering agents:** substances dissolved in water to prevent pH changing in the solution for moderate additions of acids or bases (buffering).

Human hair is divided in two types:

- a first type of hair, the so-called "Afro" hair (hair with diameter of 70-100 microns), of generally dark color, characterized in that it is
25 more or less curly according to the amount of disulphide groups between the amino acidic chains of keratin (human hair's base protein);

- a second type of hair, the so-called "Caucasian" hair (hair with lower diameter than "Afro" hair), either of dark or light color, characterized in that it is less curly than the "Afro" hair, due to the lower amount of disulphite bridges in its keratin structure.

5 Three types of techniques are currently used to straighten curly or frizzy hair:

- a. Treatment with electrical plates basically composed of two hot plates (with temperature higher than 100°C), between which hair is placed and pressed to obtain desired styling. The result disappears after the first washing with water and shampoo.
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- b. Low-temperature chemical and mechanical treatment: chemical substances are applied to hair, which is treated at temperatures lower than 100°C, to induce transitory modifications in the aspect of the capillary fiber that disappear after washing hair with water and shampoo.
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- c. High-temperature chemical and mechanical treatment: chemical substances are applied to hair, which is treated at temperatures higher than 100°C (same technique as a) above), to induce transitory modifications in the aspect of the capillary fiber that disappear after washing hair with water and shampoo.
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Currently, the problem is that, although chemical substances able to straighten human curly, frizzy or wavy hair are known on the market, said substances are impaired by high-toxicity for man and high aggressiveness for hair (i.e.: formaldehyde, sodium hydroxide, sulphur compounds, etc.).

25 Moreover, it must be said that these processes with chemical substances do not guarantee that treated hair will remain straighten for long after straightening.

The purpose of the present invention is to devise a new chemical-mechanical process (similar to the one illustrated under c) above) to
30 straighten hair semi-permanently (once treated hair will remain straight after a number of washings higher than 5). The innovation consists in the identification of a group of chemical substances that, when combined with a

high-temperature mechanical treatment, unlike the state of the art, allow for obtaining straight, soft, shiny and volumeless hair from curly and frizzy hair, said characteristics being maintained also after repeated washings with water and shampoo.

5 A further purpose of the invention is to devise a process with the aforesaid features, which uses buffering agents in very low percentage, and in any case lower than the values used in the known process, thus reducing the stress for treated hair.

10 These purposes are achieved according to the invention, with the characteristics that are listed in the attached independent claim 1.

Advantageous realizations appear from the dependent claims.

15 The process of the invention provides for the combined action of mechanical pressing with hot plates at a temperature of approximately 200°C (+/- 50°C) with preventive hair treatment with a solution containing a buffering agent.

More precisely, the process provides for:

- a) Application on hair of a solution containing a buffering acid agent from the alpha-ketoacids family;
- b) Permanence of said substance in contact with hair for 15 to 120 minutes;
- 20 c) Hair drying,
- d) Straightening of hair with hair straightening iron at temperature of approximately 200 +/- 50 C°;

25 In particular, the process of the invention has proved to induce semi-permanent modifications in the hair structure, which will remain such after repeatedly washing hair in normal conditions of use.

30 Studies carried out on the chemical substances that are already used in the cosmetic sector and tests carried out on hair have resulted in the selection of some substances, which are already known for their pH buffering properties, which, when used in combination with mechanical straightening, allow for semi-permanently eliminating the typical curves that characterize curly, frizzy or wavy hair.

In particular, the reduction or elimination of "curves" in hair is expressed as easier-to-comb hair and lower global volume of the capillary fiber due to the elimination of said curves (and, consequently, a reduction of the volume occupied by hair in the space).

5 Table 1 contains a list of all buffering agents that are known today and are included in the European Inventory of ingredients used in cosmetic products, attached to Decision no. 1996/335/CE dated 08/05/1996, and following amendments and integrations.

10 The process according to the invention advantageously uses glyoxylic acid in aqueous solution, which has demonstrated to give appreciable results compared to the other buffering agents contained in the aforementioned list.

15 Moreover, also the substances listed in Table 2 have been tested, mixed with one of the buffering agents, which are contained in the list attached to the Decision no. 1996/335/CE dated 08/05/1996 and following amendments and integrations.

Further characteristics of the invention will become apparent from the detailed description below.

20 Amongst the substances contained in the European list of ingredients used in cosmetic products and having a buffering function that have been experimented within the process of the invention, glyoxylic acid has given the best results.

Tests consisted in dissolving 10 grams of glyoxylic acid in 100 milliliters of water.

More precisely, with ponderal ratio comprised between 5 and 25%.

25 In particular, hair was washed with basic pH (7.5-8.5) shampoo, then said glyoxylic acid solution was applied (application can be made with hard bristle brush, spray or in any other way).

30 However, it must be noted that said pre-washing with said basic pH shampoo did not prove to be fundamental for semi-permanent hair straightening.

Hair was left in contact with the substance for 60 minute time (+/- 30 minutes) and then dried with the hairdryer.

Once dried, hair was straightened with hair straightening iron heated at average temperature of approximately 200 C°, +/- 50 C°. It must be noted that the materials of the iron plates do not affect the process of the invention.

Finally, hair was rinsed again with water or washed again with shampoo and dried.

At the end of treatment, hair was shiny, straight, volumeless, soft to touch, and especially pleasant.

The tests demonstrated the efficacy of the invention both on natural and chemically dyed or bleached hair.

It was experimentally proved that the efficacy of treatment is maintained over time for at least six washings, rinsings and dryings in normal use conditions of hair shampoo (as confirmed by the values contained in the tables attached to the end of this description: Tables 1-A to 1-D).

Further tests were carried out by adding one of the substances listed in table 2 to the glyoxylic acid solution.

Each substance was tested in a mixture with such glyoxylic acid solution by adding 10 grams of one of the substances listed in table 2 to 100 milliliters of said solution.

Following is a typical composition of said mixture:

Example 1:

Water	100 milliliters
Glyoxylic acid	10 grams
Potassium iodide	10 grams

Example 2:

Water	100 milliliters
Glyoxylic acid	10 grams
Dihydroxyacetone	10 grams

Example 3:

Water	100 milliliters
Glyoxylic acid	10 grams
Ozonized jojoba oil	10 grams
Inert emulsifying agent (glycerol) ..	10 grams

Example 4:

Water	100 milliliters
Glyoxylic acid	10 grams
2,4 hexadienal	10 grams

5 In example 3 an emulsifying agent (glycerol), which is inert for hair straightening, was added to the solution to facilitate ozonized jojoba oil dispersion in aqueous solution.

 The mixture obtained in example 3 is an oily mixture due to the use of jojoba oil.

10 Also at the end of treatments carried out with the mixtures illustrated in examples 1, 2, 3 and 4, hair was shiny, straight, volumeless, soft to touch and especially pleasant; moreover, hair straightening was tested in terms of time permanence.

 Further tests were carried out to see whether the effect obtained with
15 aqueous solutions could be repeated also when said substances were part of a commercial cosmetic formulation (i.e. mixed with other substances that are normally used in the cosmetic sector).

 An additional test was carried out by adding glyoxylic acid (and its mixtures with potassium iodide, dihydroxyacetone, ozonized jojoba oil and 2,4
20 hexadienal illustrated in examples 1, 2, 3 and 4) with hair treatment cosmetics found on the market.

 In particular, a hair straightening test was carried out using the formulation of a cosmetic product by INOAR Cosméticos Ltda of San Paulo, Brazil, known as "Tratamento capillar marroquino". The product was deprived
25 of its active ingredient for hair straightening.

 10 grams of glyoxylic acid were added to 100 milliliters of said cosmetic and, after carrying out the same hair treatment operations illustrated in the foregoing pages, the results were identical to the ones achieved using the same percentage ratio of glyoxylic acid in water.

30 At the end of treatment, hair was permanently shiny, straight, volumeless, and soft to touch, and with an especially pleasant look.

Similar results were obtained from four tests made with four mixtures identical to the ones of examples 1, 2, 3, and 4, using 100 milliliters of cosmetic product instead of 100 milliliters of acidulated water.

Hair was straight, volumeless, soft to touch and especially shiny when
5 exposed to sunlight or artificial light.

Experimentally, it was finally ascertained that the best range is comprised between 5% and 25% of the substances listed in table 2, so that the weight percentage of each of them is included between 5% and 25%, with completion to 100 made of inert substances with respect to straightening of
10 curly, frizzy or wavy hair.

It must be noted that tests have demonstrated that the hair straightening effect, with consequent volume reduction, is not appreciated when heating hair at temperatures of approximately 50-60°C with an ordinary hairdryer, whereas it is clearly visible until the first rinsing and/or shampooing
15 in case of treatment for a few seconds at temperatures of approximately 200+/-50 C°.

Said tests have also demonstrated that the higher the contact time of the invention and its mixtures with the capillary fiber, the higher the hair straightening effect will be.

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Table 1-A								
GLYOXYLIC ACID								
"AFRO" NATURAL CURLY HAIR IRON at 200°C								
STRAIGHTENING EFFECT ASSESSMENT (curve reduction)								
TESTED MIX	pH of initial mix	pH after contact with hair washed with basic shampoo	after no. 1 washing and drying	after no. 2 washings and dryings	after no. 3 washings and dryings	after no. 4 washings and dryings	after no. 5 washings and dryings	after no. 6 washings and dryings
WATER 100 ml	5,5	6,0	(-)	(-)	(-)	(-)	(-)	(-)
WATER 95 ml + GLYOXYLIC ACID 5 g	2,1	2,1	(+++)	(++)	(+)	(+)	(+)	(+/-)
WATER 90 ml + GLYOXYLIC ACID 10 g	2,0	2,0	(++++)	(+++)	(++)	(++)	(++)	(+)
WATER 85 ml + GLYOXYLIC ACID 15 g	1,8	1,8	(+++)	(+++)	(++)	(++)	(++)	(+)
WATER 80 ml + GLYOXYLIC ACID 20 g	1,6	1,6	(++)	(++)	(+)	(+)	(+)	(+/-)
WATER 80 ml + GLYOXYLIC ACID 25 g	1,5	1,5	(++)	(++)	(+)	(+)	(+)	(+/-)
WATER 100 ml + GLYOXYLIC ACID 10 g + Potassium Iodide 10 g	2,0	2,0	(++)	(++)	(+)	(+)	(+/-)	(+/-)
WATER 100 ml + GLYOXYLIC ACID 10 g + Dihydroxyacetone 10 g	2,0	2,0	(+++)	(+++)	(+)	(++)	(+)	(+/-)
WATER 100 ml + GLYOXYLIC ACID 10 g + Ozonized Jojoba Oil 10 g + glycerol 10 g	2,0	2,0	(++++)	(+++)	(++)	(+)	(+)	(+/-)
WATER 100 ml + GLYOXYLIC ACID 10g + 2,4 Hexadlenal 10g	2,0	2,0	(+++)	(++)	(+)	(+)	(+/-)	(+/-)
GLYOXYLIC ACID 10g + cosmetic base 100 ml	2,1	2,1	(++++)	(+++)	(++)	(++)	(++)	(+)
GLYOXYLIC ACID 10g + Potassium Iodide 10gr + cosmetic base 100 ml	2,0	2,1	(++)	(++)	(+)	(+)	(+/-)	(+/-)
GLYOXYLIC ACID 10g + Dihydroxyacetone 10 g + cosmetic base 100 ml	1,9	1,9	(+++)	(+++)	(+)	(++)	(+)	(+/-)
GLYOXYLIC ACID 10g + Ozonized Jojoba Oil 10 g + cosmetic base 100 ml	2,1	1,9	(++++)	(+++)	(++)	(+)	(+)	(+/-)
GLYOXYLIC ACID 10g + Dihydroxyacetone 10 g + cosmetic base 100 ml	2,0	1,9	(+++)	(++)	(+)	(+)	(+/-)	(+/-)
MEASURED PARAMETER			No effect	Reduction lower than 25%	Reduction between 26 and 50%	Reduction between 51 and 75%	Reduction between 76 and 90%	100% reduction
% Reduction of curves in 20 cm of hair (residual curves/total curves *100)			-	+/-	+	++	+++	++++

Table 1-B								
GLYOXYLIC ACID								
"European" NATURAL CURLY HAIR IRON at 200°C								
STRAIGHTENING EFFECT ASSESSMENT (curve reduction)								
TESTED MIX	pH of initial mix	pH after contact with hair washed with basic shampoo	after no. 1 washings and drying	after no. 2 washings and dryings	after no. 3 washings and dryings	after no. 4 washings and dryings	after no. 5 washings and dryings	after no. 6 washings and dryings
WATER 100 ml	5,5	6,0	(-)	(-)	(-)	(-)	(-)	(-)
WATER 95 ml + GLYOXYLIC ACID 5 g	2,1	2,1	(+++)	(++)	(++)	(+)	(+)	(+/-)
WATER 90 ml + GLYOXYLIC ACID 10 g	2,0	2,0	(++++)	(+++)	(+++)	(++)	(++)	(++)
WATER 85 ml + GLYOXYLIC ACID 15 g	1,8	1,8	(+++)	(+++)	(+++)	(+++)	(++)	(++)
WATER 80 ml + GLYOXYLIC ACID 20 g	1,6	1,6	(++)	(++)	(+)	(+)	(+)	(+/-)
WATER 80 ml + GLYOXYLIC ACID 25 g	1,5	1,5	(++)	(++)	(+)	(+)	(+)	(+/-)
WATER 100 ml + GLYOXYLIC ACID 10 g + Potassium Iodide 10 g	2,0	2,0	(++)	(++)	(+)	(+)	(+/-)	(+/-)
WATER 100 ml + GLYOXYLIC ACID 10 g + Dihydroxyacetone 10 g	2,0	2,0	(+++)	(+++)	(++)	(++)	(+)	(+)
WATER 100 ml + GLYOXYLIC ACID 10 g + Ozonized Jojoba Oil 10 g + glycerol 10 g	2,0	2,0	(++++)	(+++)	(++)	(+)	(+)	(+)
WATER 100 ml + GLYOXYLIC ACID 10g + 2,4 Hexadlenal 10g	2,0	2,0	(+++)	(++)	(+)	(+)	(+)	(+)
GLYOXYLIC ACID 10g + cosmetic base 100 ml	2,1	2,1	(++++)	(+++)	(++)	(++)	(++)	(+)
GLYOXYLIC ACID 10g + Potassium Iodide 10gr + cosmetic base 100 ml	2,0	2,1	(+++)	(++)	(++)	(++)	(+)	(+)
GLYOXYLIC ACID 10g + Dihydroxyacetone 10 g + cosmetic base 100 ml	1,9	1,9	(+++)	(+++)	(++)	(++)	(+)	(+)
GLYOXYLIC ACID 10g + Ozonized Jojoba Oil 10 g + cosmetic base 100 ml	2,1	1,9	(++++)	(+++)	(++)	(++)	(+)	(+)
GLYOXYLIC ACID 10g + Dihydroxyacetone 10 g + cosmetic base 100 ml	2,0	1,9	(+++)	(++)	(++)	(++)	(+)	(+)
MEASURED PARAMETER			No effect	Reduction lower than 25%	Reduction between 26 and 50%	Reduction between 51 and 75%	Reduction between 76 and 90%	100% reduction
% Reduction of curves in 20 cm of hair (residual curves/total curves *100)			-	+/-	+	++	+++	++++

Table 1-C								
GLYOXYLIC ACID								
"AFRO" NATURAL CURLY HAIR IRON at 200°C								
VOLUME REDUCTION ASSESSMENT (reduction of hair spatial volume)								
TESTED MIX	pH of initial mix	pH after contact with hair washed with basic shampoo	after no. 1 washing and drying	after no. 2 washings and dryings	after no. 3 washings and dryings	after no. 4 washings and dryings	after no. 5 washings and dryings	after no. 6 washings and dryings
WATER 100 ml	5,5	6,0	(-)	(-)	(-)	(-)	(-)	(-)
WATER 95 ml + GLYOXYLIC ACID 5 g	2,1	2,1	(++)	(++)	(+)	(+)	(+/-)	(+/-)
WATER 90 ml + GLYOXYLIC ACID 10 g	2,0	2,0	(++++)	(+++)	(++)	(++)	(++)	(+)
WATER 85 ml + GLYOXYLIC ACID 15 g	1,8	1,8	(+++)	(+++)	(++)	(++)	(++)	(+)
WATER 80 ml + GLYOXYLIC ACID 20 g	1,6	1,6	(++)	(++)	(+)	(+)	(+)	(+)
WATER 80 ml + GLYOXYLIC ACID 25 g	1,5	1,5	(++)	(++)	(+)	(+)	(+)	(+)
WATER 100 ml + GLYOXYLIC ACID 10 g + Potassium Iodide 10 g	2,0	2,0	(++)	(++)	(+)	(+)	(+)	(+)
WATER 100 ml + GLYOXYLIC ACID 10 g + Dihydroxyacetone 10 g	2,0	2,0	(+++)	(+++)	(+)	(++)	(+)	(+)
WATER 100 ml + GLYOXYLIC ACID 10 g + Ozonized Jojoba Oil 10 g + glycerol 10 g	2,0	2,0	(++++)	(+++)	(++)	(++)	(+)	(+)
WATER 100 ml + GLYOXYLIC ACID 10g + 2,4 Hexadienal 10g	2,0	2,0	(+++)	(++)	(++)	(+)	(+)	(+)
GLYOXYLIC ACID 10g + cosmetic base 100 ml	2,1	2,1	(++++)	(+++)	(++)	(++)	(++)	(+)
GLYOXYLIC ACID 10g + Potassium Iodide 10gr + cosmetic base 100 ml	2,0	2,1	(++)	(++)	(+)	(+)	(+/-)	(+)
GLYOXYLIC ACID 10g + Dihydroxyacetone 10 g + cosmetic base 100 ml	1,9	1,9	(+++)	(+++)	(+)	(++)	(+)	(+)
GLYOXYLIC ACID 10g + Ozonized Jojoba Oil 10 g + cosmetic base 100 ml	2,1	1,9	(++++)	(+++)	(++)	(+)	(+)	(+)
GLYOXYLIC ACID 10g + Dihydroxyacetone 10 g + cosmetic base 100 ml	2,0	1,9	(+++)	(++)	(++)	(+)	(+)	(+)
MEASURED PARAMETER			No effect	Reduction lower than 25%	Reduction between 26 and 50%	Reduction between 51 and 75%	Reduction between 76 and 90%	100% reduction
% Reduction of hair volume (circumference of lock with 1.0 g weight measured at half length) (final diameter/initial diameter *100)			-	+/-	+	++	+++	++++

Table 1-D								
GLYOXYLIC ACID								
"European" NATURAL CURLY HAIR IRON at 200 °C								
VOLUME REDUCTION ASSESSMENT (reduction of hair spatial volume)								
TESTED MIX	pH of initial mix	pH after contact with hair washed with basic shampoo	after no. 1 washing and drying	after no. 2 washings and dryings	after no. 3 washings and dryings	after no. 4 washings and dryings	after no. 5 washings and dryings	after no. 6 washings and dryings
WATER 100 ml	5,5	6,0	(-)	(-)	(-)	(-)	(-)	(-)
WATER 95 ml + GLYOXYLIC ACID 5 g	2,1	2,1	(+++)	(++)	(++)	(++)	(+)	(+/-)
WATER 90 ml + GLYOXYLIC ACID 10 g	2,0	2,0	(++++)	(+++)	(+++)	(++)	(++)	(++)
WATER 85 ml + GLYOXYLIC ACID 15 g	1,8	1,8	(+++)	(+++)	(+++)	(+++)	(++)	(++)
WATER 80 ml + GLYOXYLIC ACID 20 g	1,6	1,6	(++)	(++)	(+)	(+)	(+)	(+)
WATER 80 ml + GLYOXYLIC ACID 25 g	1,5	1,5	(++)	(++)	(++)	(++)	(+)	(+)
WATER 100 ml + GLYOXYLIC ACID 10 g + Potassium Iodide 10 g	2,0	2,0	(++)	(++)	(++)	(+)	(+)	(+)
WATER 100 ml + GLYOXYLIC ACID 10 g + Dihydroxyacetone 10 g	2,0	2,0	(+++)	(+++)	(++)	(++)	(+)	(+)
WATER 100 ml + GLYOXYLIC ACID 10 g + Ozonized Jojoba Oil 10 g + glycerol 10 g	2,0	2,0	(++++)	(+++)	(++)	(++)	(+)	(+)
WATER 100 ml + GLYOXYLIC ACID 10g + 2,4 Hexadienal 10g	2,0	2,0	(+++)	(++)	(+)	(+)	(+)	(+)
GLYOXYLIC ACID 10g + cosmetic base 100 ml	2,1	2,1	(++++)	(+++)	(++)	(++)	(++)	(+)
GLYOXYLIC ACID 10g + Potassium Iodide 10gr + cosmetic base 100 ml	2,0	2,1	(+++)	(++)	(++)	(++)	(+)	(+)
GLYOXYLIC ACID 10g + Dihydroxyacetone 10 g + cosmetic base 100 ml	1,9	1,9	(+++)	(+++)	(++)	(++)	(+)	(+)
GLYOXYLIC ACID 10g + Ozonized Jojoba Oil 10 g + cosmetic base 100 ml	2,1	1,9	(+++)	(+++)	(++)	(++)	(+)	(+)
GLYOXYLIC ACID 10g + Dihydroxyacetone 10 g + cosmetic base 100 ml	2,0	1,9	(+++)	(++)	(++)	(++)	(+)	(+)
MEASURED PARAMETER			No effect	Reduction lower than 25%	Reduction between 26 and 50%	Reduction between 51 and 75%	Reduction between 76 and 90%	100% reduction
% Reduction of hair volume (circumference of lock with 1.0 g weight measured at half length) (final diameter/initial diameter *100)			-	+/-	+	++	+++	++++

TABLE 1

N.	Name INCI
1	1,6-HEXANEDIAMINE
2	2-AMINOBUTANOL
4	ACETYL MANDELIC ACID
5	ADIPIC ACID
6	ALUMINUM GLYCINATE
7	ALUMINUM LACTATE
8	ALUMINUM TRIFORMATE
9	AMINOETHYL PROPANEDIOL
10	AMINOMETHYL PROPANEDIOL
11	AMINOMETHYL PROPANOL
12	AMINOPROPANEDIOL
13	AMMONIA
14	AMMONIUM ACETATE
15	AMMONIUM BICARBONATE
16	AMMONIUM CARBAMATE
17	AMMONIUM CARBONATE
18	AMMONIUM CHLORIDE
19	AMMONIUM GLYCOLATE
20	AMMONIUM HYDROXIDE
21	AMMONIUM LACTATE
22	AMMONIUM MOLYBDATE
23	AMMONIUM NITRATE
24	AMMONIUM PHOSPHATE
25	AMMONIUM THIOCYANATE
26	AMMONIUM VANADATE
27	ASCORBIC ACID
28	AZELAIC ACID
29	BABASSU ACID
30	BAKUHAN
31	BENZILIC ACID
32	BIS-HYDROXYETHYL TROMETHAMINE
33	BISMUTH CITRATE
34	BORIC ACID
35	CALCIUM CARBONATE
36	CALCIUM CITRATE
37	CALCIUM DIHYDROGEN PHOSPHATE
38	CALCIUM HYDROXIDE
39	CALCIUM LACTATE
40	CALCIUM OXIDE
41	CALCIUM PHOSPHATE
42	CITRIC ACID
43	CLAY MINERALS
44	CYCLOHEXYLAMINE

45	DECAPEPTIDE-7
46	DIAMMONIUM CITRATE
47	DIAMMONIUM PHOSPHATE
48	DIBUTYL ETHANOLAMINE
49	DIETHYL ETHANOLAMINE
50	DIMETHYL ISOPROPANOLAMINE
51	DIMETHYL MEA
52	DIOLEOYL EDETOLMONIUM METHOSULFATE
53	DIOLEYL PHOSPHATE
54	DIPOTASSIUM PHOSPHATE
55	DIPROPYLENETRIAMINE
56	DISODIUM FUMARATE
57	DISODIUM PHOSPHATE
58	DISODIUM PYROPHOSPHATE
59	DISODIUM TARTRATE
60	ETHANOLAMINE
61	ETHANOLAMINE HCl
62	ETHYL ETHANOLAMINE
63	FUMARIC ACID
64	GALACTURONIC ACID
65	GLUCOHEPTONIC ACID
66	GLUCONIC ACID
67	GLUCURONIC ACID
68	GLUTARIC ACID
69	GLYCINE
70	GLYCOLIC ACID
71	GLYOXYLIC ACID
72	GUANIDINE CARBONATE
73	GUANIDINE HCl
74	HYDROBROMIC ACID
75	HYDROCHLORIC ACID
76	HYDROXYETHYLPIPERAZINE ETHANE SULFONIC ACID
77	IMIDAZOLE
78	ISOBUTYRIC ACID
79	ISOPROPANOLAMINE
80	ISOPROPYLAMINE
81	LACTIC ACID
82	LACTOBIONIC ACID
83	LAURYL p-CRESOL KETOXIME
84	LITHIUM HYDROXIDE
85	MAGNESIUM ACETATE
86	MAGNESIUM CARBONATE HYDROXIDE
87	MAGNESIUM HYDROXIDE
88	MAGNESIUM LACTATE
89	MAGNESIUM OXIDE
90	MALEIC ACID

91	MALIC ACID
92	MALONIC ACID
93	MALTOBIONIC ACID
94	MEA-BORATE
95	METAPHOSPHORIC ACID
96	METHOXY PEG-114/POLYEPSILON CAPROLACTONE
97	METHYLETHANOLAMINE
98	MONOSODIUM CITRATE
99	PENTAPOTASSIUM TRIPHOSPHATE
100	PENTASODIUM TRIPHOSPHATE
101	PHENYL MERCURIC BORATE
102	PHOSPHONOBUTANETRICARBOXYLIC ACID
103	PHOSPHORIC ACID
104	PHOSPHORUS PENTOXIDE
105	POTASSIUM BICARBONATE
106	POTASSIUM BIPHTHALATE
107	POTASSIUM BORATE
108	POTASSIUM CARBONATE
109	POTASSIUM CITRATE
110	POTASSIUM HYDROXIDE
111	POTASSIUM LACTATE
112	POTASSIUM MAGNESIUM ASPARTATE
113	POTASSIUM OXIDE
114	POTASSIUM PHOSPHATE
115	POTASSIUM SODIUM TARTRATE
116	POTASSIUM TARTRATE
117	PROPANE TRICARBOXYLIC ACID
118	QUINIC ACID
119	RIBONIC ACID
120	SEBACIC ACID
121	SODIUM ACETATE
122	SODIUM ALUMINATE
123	SODIUM ALUMINUM LACTATE
124	SODIUM ARACHIDATE
125	SODIUM ASPARTATE
126	SODIUM BICARBONATE
127	SODIUM BISULFATE
128	SODIUM BORATE
129	SODIUM BUTOXYETHOXY ACETATE
130	SODIUM CARBONATE
131	SODIUM CITRATE
132	SODIUM FORMATE
133	SODIUM FUMARATE
134	SODIUM GLYCOLATE
135	SODIUM HUMATE
136	SODIUM HYDROXIDE

137	SODIUM LACTATE
138	SODIUM METAPHOSPHATE
139	SODIUM METASILICATE
140	SODIUM OXIDE
141	SODIUM PHOSPHATE
142	SODIUM SESQUICARBONATE
143	SODIUM SILICATE
144	SODIUM SUCCINATE
145	SODIUM TRIMETAPHOSPHATE
146	STRONTIUM HYDROXIDE
147	SUCCINIC ACID
148	SULFURIC ACID
149	TARTARIC ACID
150	TAURINE
151	TEA-DIRICINOLEATE/IPDI COPOLYMER
152	TEA-HYDROIODIDE
153	TEA-SULFATE
154	TETRAHYDROXYETHYL ETHYLENEDIAMINE
155	TETRAPOTASSIUM PYROPHOSPHATE
156	TETRASODIUM PYROPHOSPHATE
157	TRIETHANOLAMINE
158	TRIISOPROPANOLAMINE
159	TRISODIUM PHOSPHATE
160	TRISODIUM SULFOSUCCINATE
161	TRITICUM VULGARE PROTEIN
162	TRITICUM VULGARE SEED EXTRACT
163	TROMETHAMINE
164	UREA
165	URIC ACID
166	ZINC CARBONATE HYDROXIDE
167	ZINC GLYCINATE
168	ZINC HEXAMETAPHOSPHATE
169	ZINC MAGNESIUM ASPARTATE

TABLE 2

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|---|
| <ul style="list-style-type: none">• potassium iodide CAS n. 7681-11-0 (Used as antimicrobial)• dihydroxyacetone CAS n. 96-26-4 (Used as tanning)• Ozonized Jojoba oil (No n. CAS) (Used as emollient)• 2,4 Hexadienal CAS n. 142-83-6 (Used as perfuming) |
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Claims

1. A method for semi-permanent hair straightening, comprising the following steps:
 - a) Application on hair of a solution containing glyoxylic acid;
 - b) Permanence of substance in contact with hair for 15 to 120 minutes;
 - c) Hair drying;
 - d) Hair straightening with hair straightening iron at temperature of 200 ± 50 C°.
2. The method as claimed in claim 1, further comprising prewashing with basic pH shampoo before the step a); and rinsing after step d).
3. The method as claimed in claim 1 or 2, further comprising hair washing with acid pH washing after the step d).
4. The method as claimed in any one of claims 1 to 3, wherein the step b) has average duration of 60 ± 30 minutes.
5. The method as claimed in any one of claims 1 to 4, wherein the glyoxylic acid is dissolved in aqueous solution.
6. The method as claimed in claim 5, wherein the glyoxylic acid is dissolved in aqueous solution in ponderal ratio between 5% and 25% in weight.
7. The method as claimed in any one of claims 1 to 6, wherein the glyoxylic acid is emulsified in oily solution.
8. The method as claimed in any one of claims 1 to 7, wherein the glyoxylic acid is mixed with at least one of substances selected from the group consisting of potassium iodide, dihydroxyacetone, ozonized Jojoba oil and 2,4-hexadienal.