SELF-HEATING SHAVING PREPARED COMPOSITION

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This invention relates to an aqueous cosmetic composition for use on skin or hair, particularly a shaving preparation composition, and pertains more specifically to a two-part composition of the type described in which the two parts are adapted to be mixed immediately before or during application with simultaneous evolution of sensible heat. The invention may also be embodied in aqueous shampoos, hair conditioning rinses, hair bleaches, hair dyes, and hair dye removers.

One object of the present invention is to provide a self-heating composition for application to the skin or hair.

Another object is to provide a two-part aqueous cosmetic composition adapted to be applied to the skin or hair with mixing of the two parts and simultaneous evolution of heat.

Still another object is to provide an exothermic two-part aqueous liquid cosmetic composition (including creams and pastes) of the type described in which one part contains an oxidant and the other contains a reductant reactive therewith upon mixing to evolve sensible heat.

A further object is to provide a package containing an aqueous cosmetic composition and having two compartments, one containing an oxidant and the other a reductant reactive therewith no produce sensible heating of the composition by mixing.

Still a further object is to provide a pressurized package containing a two-part exothermic cosmetic composition and having two compartments, one containing one part of the composition including an oxidant, and the other containing a second part including a reductant reactive therewith upon mixing to produce sensible heating, the package including a liquefied gaseous propellant under pressure for expelling the composition from the compartments and expanding the expelled composition into foam.

Other and further objects will be apparent from the description which follows.

Cosmetic compositions such as shaving preparation compositions for application to the skin or hair are often more effective for their intended purpose if they are applied hot. However, it is frequently inconvenient or difficult to provide them in heated form. While it is sometimes possible to mix them with hot water before use, it is necessary to have a supply of hot water available for this purpose. Moreover, when the compositions are supplied in ready-to-use form, particularly when they are supplied in a hermetically sealed pressurized package with a liquefied gaseous propellant, the entire package must be heated, a procedure which is slow, difficult, and even dangerous under some conditions.

It has now been found that by providing a composition in two parts adapted to be mixed with each other during or immediately before use, one part containing an oxidant and the other a reductant, sufficient heat is evolved by reaction of the ingredients to produce a sensible rise in the temperature of the mixture. By “sensible” rise in temperature is meant an increase of at least 25° F. above room temperature within one minute of mixing at room temperature. While any suitable two-compartment container may be employed for such a package, such as that shown in Hopkins U.S. Patent 1,535,529, the container in a preferred embodiment is a two-compartment pressurized container of a form known to the art. For best results the form of pressurized container and valve shown in co-pending application Serial No. 333,089, filed December 24, 1963, now Patent No. 3,241,722 granted March 22, 1966, may be employed. The particular construction of the container forms no part of the present invention.

The exothermic or self-heating two-part aqueous cosmetic composition of the present invention may include any suitable conventional ingredients. It is usually desirable that the part containing the reductant contain also all of the remaining ingredients except for a portion of the water. However, the part containing the oxidant may also include, in addition to a portion of the water, any of the remaining ingredients which are inert to the oxidant. When a liquefied gaseous propellant is present, it may be packaged with either part or even with both, depending upon the construction of the container and of the dispensing valve.

The ingredients commonly employed in cosmetic compositions such as shaving preparation compositions include soaps, thickeners and emulsifying agents, foam boosters, and germicides; fatty alcohols and acids, fatty oils and mineral oils, pigments and fillers, thickeners, astringents, emollients, solubilizers, humectants, alkalinizing agents and buffers, etc. Any or all of the foregoing ingredients as well as other conventional ingredients may be present in the compositions of the present invention.

The oxidizing agent or oxidant employed may be any one of a wide variety of materials depending upon the precise requirements of the particular composition in which it is used. Among the oxidants which may be used are hydrogen peroxide, urea hydrogen peroxide, sodium peroxide, sodium perborate, sodium persulfate, ammonium persulfate, potassium persulfate, and mixtures of any two or more of the foregoing.

The quantity of oxidants and reductants present will depend in part upon how much heat is desired and in part upon the nature of the by-products which result from the reaction and their effect, if any, upon the desired properties of the composition. It is generally desirable that the amount of reductant be at least as great as the amount required for stoichiometric reaction with all of the oxidants present.

In some cases, however, the quantity of oxidant initially present may be greater than the stoichiometric quantity required for reaction with the reductant because it may be desirable to ensure complete utilization of the reductant.

Up to 10 mole percent excess oxidant may be employed, being completely consumed within 30 seconds when used with a mixture of reductant, catalyst, and alkylamine as described hereinafter. Both the reductants and the oxidants, as well as the by-products of their reaction, must be harmless to the skin and hair.

The proportion of oxidant and of reductant to the total composition will depend upon how much heat is desired, how much is required to heat up the composition itself, and the rate at which the heat is dissipated. As little
as 0.8 percent by weight of oxidant based on the total weight of the aqueous composition exclusive of any propellant present will suffice, when a stoichiometrically equivalent quantity of reductant is used, to produce a sensible temperature rise (at least 25°F, from room temperature within one minute) in the composition, but at least 1 percent by weight is preferred. As the proportion of oxidant and/or reductant present in the composition is increased, the rate of heat generation approaches a maximum which varies depending upon the identities of the particular oxidant and reductant used. Once the maximum rate of heating has been achieved, further increase in the proportion of oxidant or reductant present has no substantial further effect on the heating rate although the total quantity of heat evolved and hence the ultimate temperature to which the composition is heated may still increase. In the case of hydrogen peroxide or urea peroxide, which are the preferred oxidants, it is desirable to avoid concentrations above 10 percent by weight at any time, even before the two parts of the composition are mixed, so that if a large proportion of these oxidants is desired, a greater proportion of the total water of the composition must be present in the part containing the oxidant than would be necessary in the case of a smaller quantity of oxidant. It is also desirable to have present in the part of the composition containing these peroxides conventional stabilizers such as phenacetin, stannates, and acid phosphates in order to insure stability of the peroxide solution during storage.

Because of the special characteristics required in the shave preparation compositions of the present invention there is only a limited number of reducing agents or reductants which may be employed. The characteristics required in the composition and its ingredients, and in the products and by-products of any reaction which takes place in the composition include rapid and adequate heat evolution, adequate softening of hair, and stability during normal storage, as well as freedom from objectionable color and odor, from toxicity, from physiological activity, from irritancy and sensitization, and from adverse effects on blades and razors. The amount of heat evolved must be sufficient to raise the temperature of the entire composition by approximately 25°F. above room temperature, during a period of one minute or less after mixing at room temperature. Although there exists a substantial number of reductants which exhibit the first three of the foregoing characteristics, most of them lack to an appreciable extent one or more of the remaining characteristics. The reductants which have been found to possess all of the foregoing characteristics are thiourea and compounds having the structure

\[
\text{CH}_2\text{S}\text{R}_1\text{R}_2
\]

in which \(R_1\) may be hydrogen, lower alkyl, lower hydroxalkyl, lower alkoxy, or lower alkanoyl, and \(R_2\) may be any of the foregoing except hydrogen and may in addition be phenyl. Among such compounds are 1-phenyl-2-thiobarbituric acid, 1-phenyl-5-ethyl-2-thiobarbituric acid, 1-methyl-2-thiobarbituric acid, 1-methyl-5-methyl-2-thio-barbituric acid, 1-ethyl-5-phenyl-2-thiobarbituric acid, 1-ethyl-5-methyl-2-thiobarbituric acid, and the like, all of which are soluble in weakly alkaline aqueous media. The oxidants which may be used with the foregoing reductants to produce the desired results include hydrogen peroxide and urea hydrogen peroxide.

The oxidant is present in an amount from 0.8 to about 2 percent by weight of the total aqueous composition exclusive of any liquefied gaseous propellant which may also be present. The proportions of oxidant and reductant relative to each other are usually adjusted as described above to insure complete reaction of the oxidant with a small amount of excess reductant of the order of 5 to 10 percent of the total quantity of reductant. However, in some cases an excess of oxidant may be used, as pointed out above. Moderate amounts of liquefied gaseous propellants to 5 to 10 percent by weight of the aqueous composition may be included with one or both parts of the composition in a pressure package without requiring any increase in oxidant or reductant to achieve the desired temperature increase.

The preferred shaving preparation compositions also include a catalyst to accelerate the reaction and accelerate the rise in temperature of the composition, although in some cases it is possible to achieve the same result by employing a large excess of reductant. While a variety of catalysts which accelerate such oxidation reactions are well known and may be used, best results are achieved with such water soluble inorganic or organic bases as alkali metal (including ammonium) tetrates (or molybdates) e.g., sodium tungstate, potassium tungstate, sodium molybdate, ammonium molybdate, etc. which not only accelerate the reaction but also cause it to follow a different course than that followed by the absence of catalyst, at least in the case when thiourea is the reductant, so that there are not produced the objectionable end products which are formed in the absence of catalyst when thiourea is used. The amount of catalyst required varies with the identity of the particular catalyst employed and also with the identity of the oxidant and reductant present, as is well known. However, in the case of the preferred tungstate catalyst, the quantity of catalyst for best results is approximately 7.5x10\textsuperscript{-2} gram atoms of tungsten per mole of the reductant, while in the case of the molybdates approximately 17.5x10\textsuperscript{-2} gram atoms of molybdenum per mole of the reductant is best. As little as half as much of the catalyst may be used successfully; while excess catalyst may be used, the additional quantity has very little effect. Inasmuch as the catalyst promotes decomposition of the oxidant, it should be kept separate therefrom until immediately before mixing of the two parts of the composition; it is preferably included in that part of the composition containing the reductant.

The pH of the composition may be in the range from 5 to 10, preferably, in the case of soap-containing compositions, from 7 to 10. For optimum results with soap-containing shaving preparation compositions, it should be in the range from 7.5 to 8.0. In order to maintain the composition within the desired pH ranges mentioned above, it may be necessary to include an alkali or a buffer to neutralize an acid-by-product which is formed. In the case of soap-containing shaving preparation compositions, it is also necessary to include sufficient alkaline material to neutralize any inherent acidity of the reductants themselves.

While a wide variety of alkaline agents or buffers may be used to control the pH, such as sodium, potassium, or ammonium hydroxide or sodium, potassium, calcium or ammonium carbonate or bicarbonate, best results are obtained when a lower polyalkanolamine such as diethanolamine, diisopropanolamine, triethanolamine, or trisopropanolamine. When carbonate or bicarbonate is present and an acid by-product is produced during the exothermic reaction it is also possible to obtain a self-foaming composition which may be desirable in certain cases. It has been found permissible to have an excess of one of the preferred polyalkanolamine alkaline materials present over and above the minimum required to maintain the desired pH, the excess preferably amounting to up to 5 percent by weight of the total aqueous composition, exclusive of any propellants present.

Any conventional liquefied gaseous propellant may be employed in conjunction with the cosmetic compositions of the present invention. Among the most useful and
readily available are hydrocarbons such as n-butane or isobutane present alone or in mixtures thereof with propane; and halogenated hydrocarbons such as those sold under the trademark Freon, for example, dichlorodifluoromethane, monochlor trifluoromethane, trichloro- 
fluoroethane, dichlorotetrafluoroethane, etc.

The following specific examples are intended to illustrate more fully the nature of the invention but are not intended to be a limitation upon its scope.

**Example 1**

An aqueous liquid shaving preparation composition was prepared in two parts.

The first part had the following composition, in which the parts are by weight:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thiourea</td>
<td>1.52</td>
</tr>
<tr>
<td>Sodium tungstate dihydrate</td>
<td>0.50</td>
</tr>
<tr>
<td>98% triethanolamide</td>
<td>8.20</td>
</tr>
<tr>
<td>Triple pressed stearic acid</td>
<td>7.55</td>
</tr>
<tr>
<td>Stripped coconut fatty acids</td>
<td>0.96</td>
</tr>
<tr>
<td>Potassium hydroxide pellets (86%)</td>
<td>1.07</td>
</tr>
<tr>
<td>Sodium lauryl sarcosinate</td>
<td>3.22</td>
</tr>
<tr>
<td>Stearamide</td>
<td>0.96</td>
</tr>
<tr>
<td>Perfume</td>
<td>0.59</td>
</tr>
<tr>
<td>Distilled water</td>
<td>72.13</td>
</tr>
</tbody>
</table>

The second part consisted of an aqueous solution containing 8.2 percent hydrogen peroxide by weight together with the usual small amounts of sodium stannate and phenacetin as stabilizers.

The two parts were packaged in separate compartments of a two-compartment pressure container of the type described in co-pending application Ser. No. 335,089, now U.S. Patent No. 3,341,722. The first part was added under pressure of approximately 45 psig at 70°F., a mixture of isobutane and propane in the amount of 3.5 percent by weight of the total composition. When the two parts were discharged simultaneously from the container at room temperature with mixing, a foamy lather was produced, the temperature of which rose to about 120°F. from 15°F. within 20 seconds. Substantially no color or odor was observed, and no peroxide could be detected in the lather after 30 seconds. The lather was non-irritating, non-toxic and non-sensitizing, and possessed excellent beard-softening characteristics, providing an excellent shave. The two-part composition was stable upon storage at room temperature for a period of many months.

**Example 2**

A two-part shaving preparation composition was prepared which was the same as that described in Example 1 except that there was employed in the first part the following composition, in which the parts are by weight:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-phenyl-5-ethyl-2-thiobarbituric acid</td>
<td>5.00</td>
</tr>
<tr>
<td>Ammonium molybdate tetrahydrate</td>
<td>11.20</td>
</tr>
<tr>
<td>98% triethanolamide</td>
<td>11.20</td>
</tr>
<tr>
<td>Triple pressed stearic acid</td>
<td>7.55</td>
</tr>
<tr>
<td>Stripped coconut fatty acids</td>
<td>0.96</td>
</tr>
<tr>
<td>Potassium hydroxide pellets (86%)</td>
<td>1.07</td>
</tr>
<tr>
<td>Sodium lauryl sarcosinate</td>
<td>3.22</td>
</tr>
<tr>
<td>Stearamide</td>
<td>0.96</td>
</tr>
<tr>
<td>Perfume</td>
<td>0.39</td>
</tr>
<tr>
<td>Distilled water</td>
<td>66.09</td>
</tr>
</tbody>
</table>

When discharged with simultaneous mixing at room temperature, the foamy lather became heated and possessed all of the other characteristics of the lather of Example 1. Similar results are obtained using as the reductant a molar equivalent amount of 1-methyl-2-thiobarbituric acid in place of the 1-phenyl-5-ethyl-2-thiobarbituric acid.

**Example 3**

An aqueous liquid brushless shaving preparation composition was prepared in two parts. The first part had the following composition, in which the parts are by weight:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral oil</td>
<td>15.0</td>
</tr>
<tr>
<td>Stearyl alcohol</td>
<td>27.0</td>
</tr>
<tr>
<td>Behenamide</td>
<td>9.0</td>
</tr>
<tr>
<td>Sodium laurylsuccinate (30% aqueous soln.)</td>
<td>9.0</td>
</tr>
<tr>
<td>Triethanolamine</td>
<td>10.0</td>
</tr>
<tr>
<td>1-phenyl-2-thiobarbituric acid</td>
<td>4.8</td>
</tr>
<tr>
<td>Sodium tungstate dihydrate</td>
<td>0.5</td>
</tr>
<tr>
<td>Water</td>
<td>24.7</td>
</tr>
</tbody>
</table>

The second part consisted of an aqueous solution containing 7.9% hydrogen peroxide by weight together with the usual small amounts of sodium stannate and phenacetin as stabilizers.

Upon mixing of the two parts in the proportion of 3 parts by weight of the first part to 1 part by weight of the second part at room temperature, a thick, smooth, and uniform brushless type shaving preparation resulted, the temperature of which reached about 60°F. within thirty seconds. Substantially no color or odor was observable. The composition was non-irritating, non-toxic, and non-sensitizing and possessed excellent beard-softening characteristics, providing an excellent shave.

**Example 4**

A two-part shaving preparation composition was prepared in which the first part was the same as the first part described in the preceding example except that it contained an additional thirty parts by weight of water. The second part consisted simply of solid urea hydrogen peroxide.

Upon mixing of the two parts at room temperature in the proportion of 17 parts by weight of the first to one part of the second a brushless type cream was produced which attained a temperature of about 60°F. within thirty seconds and which was otherwise substantially the same as the product of the preceding example.

Although specific embodiments of the invention have been described herein, it is not intended to limit the invention solely thereto, but to include all of the obvious variations and modifications within the spirit and scope of the appended claims.

What is claimed is:

1. A package containing an aqueous exothermic shaving preparation composition, said package having two compartments for separate storage of ingredients of said composition from which the ingredients are adapted to be dispensed simultaneously for exothermic reaction with each other, the first compartment containing an oxidant selected from the class consisting of hydrogen peroxide and urea hydrogen peroxide and the second compartment containing a reductant selected from the class consisting of thiourea and
2. A package as claimed in claim 1 in which the second compartment also contains a catalyst for the reaction between the oxidant and reductant, which catalyst is selected from the class consisting of alkali metal and ammonium tungstates and molybdates.

3. A package as claimed in claim 2 including a liquefied gas propellant under pressure for expelling said ingredients from the compartments.

4. A package containing an aqueous cosmetic composition selected from the class consisting of those to be applied to the skin, shampoos, hair conditioning rinses, hair bleaches, hair dyes, and hair dye removers, said package having two compartments for separate storage of ingredients of said composition from which the ingredients are adapted to be dispensed for mixing with each other with the evolution of sensible heat, the first compartment containing an oxidant selected from the class consisting of hydrogen peroxide and urea hydrogen peroxide in an aqueous medium and the second compartment containing in an aqueous medium a reductant selected from the class consisting of thiourea and a compound having the structure

\[
\begin{array}{c}
\text{H} \\
\text{O=O} \\
\text{C=O} \\
\text{N=\text{R}} \\
\text{S}
\end{array}
\]

\[
\begin{array}{c}
\text{H} \\
\text{C=O} \\
\text{O=O} \\
\text{N=\text{R}} \\
\text{S}
\end{array}
\]

in which \( \text{R} \) is a member of the class consisting of hydrogen, lower alkyl, lower hydroxyalkyl, lower alkoxy, and lower alkanoyl and \( \text{R} \) is a member of the class consisting of phenyl, lower alkyl, lower hydroxyalkyl, lower alkoxy, and lower alkanoyl.

5. A package as claimed in claim 4 in which the second compartment also contains a catalyst for the reaction between the oxidant and reductant, said catalyst being selected from the class consisting of alkali metal and ammonium tungstates and molybdates.

References Cited


ALBERT T. MEYERS, Primary Examiner.
JULIAN S. LEVITT, Examiner.
D. R. MAHANAND, Assistant Examiner.