

UNITED STATES PATENT OFFICE

2,541,345

CHEMICAL HEATING COMPOSITION

Maison G. de Navarre, Grosse Pointe Farms,
Mich., and William C. Griffin, Newport, Del.,
assignors to Atlas Powder Company, Wilmington,
Del., a corporation of Delaware

No Drawing. Application October 28, 1947,
Serial No. 782,670

8 Claims. (Cl. 132—36.2)

1

The present invention relates to chemical heating compositions.

An object of the invention is to provide an improved heating composition of the type employing an inorganic oxidizing agent and an organic oxidizable material which undergo an exothermic chemical reaction.

Another object is to provide an improved chemical heating composition useful in the machineless waving of hair.

The above and other objects will become apparent in the course of the following description.

This invention relates to the type of chemical heat generation in which a soluble oxidizing agent is enclosed in a water-permeable envelope and an aqueous solution of oxidizable material is brought into contact with the oxidizing agent to produce an exothermic reaction. In the machineless permanent waving of hair, the envelope containing the oxidizing material is made of appropriate size and shape so that it can be wrapped about a tress of hair formed into the desired shape on a mandrel. The oxidizable solution is brought into contact with this envelope by means of an absorbent pad impregnated with the solution and suitably shaped to engage the envelope. The envelope and pad are pressed together against the hair by means of a clamp in the conventional manner. The oxidizing material generally employed is potassium permanganate, although other soluble permanganates such as the sodium and ammonium salts are useful, and other oxidizing agents such as soluble chlorates can be used. As oxidizable materials, the art has generally employed glycerol, hexitols, some of the sugars, and glycols. Difficulties have been experienced in using these oxidizable materials by reason of their hygroscopicity which makes it difficult to stabilize the solutions as to water content. The water content is a critical factor in formulating these oxidizable solutions and substantial variation from the desired composition results in failure of the heating unit to produce the necessary degree of heating or results in the production of an undesirably high temperature during the reaction. Certain of the solid members of the class of materials usually employed cause a further difficulty due to their tendency to crystallize out of the solution, thus changing the composition in a way to reduce the effectiveness of the unit to generate heat.

2

In accordance with the present invention, it has been found that chemical heating units of the type described are improved with respect to stability and heat control by the use of a novel oxidizable solution. The oxidizable solution used according to the invention contains water, ethylene glycol, and a polyoxyethylene ether of a compound selected from the group consisting of hexitols, hexoses, and hexobioses, in which the ether contains from 3 to 100 oxyethylene groups per molecule. The polyoxyethylene ethers of this class are water-soluble, non-crystallizing materials which are much less hygroscopic than the materials formerly used and have little or no tendency to attract additional water to the solutions as they are prepared for use. These polyoxyethylene ethers have been found to undergo an exothermic reaction with soluble permanganates, although by themselves this reaction is not sufficiently vigorous to produce the necessary high temperature for hair waving. The addition of ethylene glycol has been found to contribute to the reaction in such a way that the desired temperature, 100° C. or slightly higher, is readily attained. The combination of the ethylene glycol and the polyoxyethylene ether in the oxidizable solution produces a reaction with the soluble permanganate which causes the prompt attainment of the desired high temperature and continues to generate heat at this temperature for a period of several minutes. The ethylene glycol alone gives a characteristic rapid rise to a maximum temperature and rapid falling off, whereas the combination of ethylene glycol and polyoxyethylene ether shows a sustained rate of heat generation for a much longer useful period.

The oxidizable solution used according to the invention can be distributed in bulk form and the operator can dip a suitable absorbent pad into the solution and place it in contact with the permanganate envelope at the time of use. Alternatively, absorbent pads of suitable structure can be impregnated with the solution and distributed in their moist condition ready for use.

The polyoxyethylene ethers referred to are known compounds which are preferably prepared by reacting the selected hexitol or sugar with ethylene oxide under conditions of elevated temperature and pressure. Such compounds and

methods of making them are described, for ex-

ample, in U. S. Patent 1,922,459 to Schmidt and Meyer and in German Patent 368,413 to Bayer & Co. Although not essential, it has been found advantageous to produce the compounds for use in this invention by reacting ethylene oxide with a solution of the hexitol or sugar in water. The amount of water that can be used is variable over a wide range, suitable proportions being from 5 to about 50% water based on the total composition. The water reacts with ethylene oxide under these conditions to form glycols, principally the polyethylene glycols. The nature of the compositions produced depends on the relative proportions of the hexitol or sugar, water, and ethylene oxide. It is therefore to be understood that these products are complex mixtures of related materials which differ from one another principally in the number of oxyethylene groups contained.

The polyoxyethylene ethers referred to can be made from any of the hexitols, the most important members being sorbitol, mannitol, and dulcitol, or any of the hexoses of which the most useful members are glucose and fructose, or any of the hexobioses of which the most important are sucrose, lactose, and maltose. If desired, products can be made from mixtures of any of these compounds.

Preferred oxidizable solutions are those which contain by weight from 70 to 35% of the polyoxyethylene ether, from 20 to 50% ethylene glycol and from 10 to 30% water, to a total of 100%. The examples illustrate several typical ratios within these ranges.

While the invention is particularly directed to compositions for use in the machineless waving of hair, it will be appreciated that these compositions are also useful in other applications such as body warmers and food warmers. Certain of the compositions of the invention are particularly well adapted to these other uses by reason of the fact that they produce their heat over a prolonged period of time.

The following table sets forth the composition in weight percent of a number of oxidizable solutions that can be used in conjunction with potassium permanganate to generate heat for use in hair waving or for other purposes. These solutions are to be used in the conventional manner, for example, on absorbent pads pressed into contact with a permeable envelope containing the permanganate.

Example	Polyoxyethylene Ether	Per Cent Ether	Per Cent Ethylene Glycol	Per Cent Water
1-----	Polyoxyethylene sorbitol with 3 oxyethylene groups per molecule.	45	45	10
2-----	Polyoxyethylene sorbitol with 6 oxyethylene groups per molecule.	40	40	20
3-----	Polyoxyethylene ether produced by reacting 218 parts by weight of ethylene oxide with 100 parts of sorbitol dissolved in 50 parts of water.	45	45	10
4-----	Polyoxyethylene ether produced by reacting 1138 parts by weight of ethylene oxide with 100 parts of sorbitol dissolved in 18 parts of water.	45	45	10
5-----	Polyoxyethylene ether produced by reacting 2132 parts by weight of ethylene oxide with 100 parts of sorbitol dissolved in 18 parts of water.	45	45	10
6-----	Polyoxyethylene ether produced by reacting 2846 parts by weight of ethylene oxide with 100 parts of sorbitol dissolved in 18 parts of water.	45	45	10
7-----	Polyoxyethylene ether produced by reacting 183 parts by weight of ethylene oxide with 100 parts of glucose dissolved in 25 parts of water.	45	45	10
8-----	Polyoxyethylene ether produced by reacting 220 parts by weight of ethylene oxide with 100 parts of glucose dissolved in 50 parts of water.	45	45	10
9-----	Same as Example 8.	67.5	22.5	10
10-----	Polyoxyethylene ether produced by reacting 440 parts by weight of ethylene oxide with 100 parts of glucose dissolved in 50 parts of water.	40	40	20
		45	45	10

Many variations of the compositions of the examples can be made without departing from the

concept of the invention. The composition of Example 9 is the preferred product for use in machineless hair waving because of the speed with which the waving temperature is attained and the high total heat evolved.

It will be obvious that other ingredients can be added to the compositions of the invention for various specific purposes. Thus, materials can be added to impart a pleasant odor to the vapors evolved during use. Coloring agents can likewise be added.

What is claimed is:

1. An oxidizable composition for use in heat generating reaction with a water-soluble oxidizing agent, comprising from 70 to 35% by weight of at least one polyoxyethylene ether of a compound selected from the group consisting of hexitols, hexoses, and hexobioses, said ether containing from 3 to 100 oxyethylene groups per molecule, from 20 to 50% by weight ethylene glycol, and from 10 to 30% by weight of water, to a total of 100%.

2. An oxidizable composition for use in heat generating reaction with a water-soluble oxidizing agent, comprising from 70 to 35% by weight of polyoxyethylene ether of sorbitol containing from 3 to 100 oxyethylene groups per molecule, from 20 to 50% by weight ethylene glycol, and from 10 to 30% by weight water, to a total of 100%.

3. An oxidizable composition for use in heat generating reaction with a water-soluble oxidizing agent, comprising about 20% by weight water, about 40% ethylene glycol, and about 40% of the reaction product of 220 parts by weight ethylene oxide with 100 parts by weight glucose and 50 parts by weight water, said reaction product containing a polyoxyethylene ether of glucose having from 3 to 100 oxyethylene groups per molecule.

4. An oxidizable composition for use in heat generating reaction with a water soluble oxidizing agent, comprising from 70 to 35% by weight of polyoxyethylene ether of glucose containing from 3 to 100 oxyethylene groups per molecule, from 20 to 50% by weight of ethylene glycol, and from 10 to 30% by weight of water, to a total of 100%.

5. A composition comprising (1) from 70 to 35% by weight of a polyoxyethylene ether containing from 3 to 100 oxyethylene groups per molecule of at least one member of the group

consisting of hexitols, hexoses and hexobioses, together with the other reaction products obtained

5

when the said polyoxyethylene ether is prepared by the reaction of ethylene oxide with a solution composed of from 5 to about 50% water and from 95 to about 50% of said member; (2) from 20 to 50% by weight of ethylene glycol; and (3) from 10 to 30% by weight of water, to a total of 100%.

6. A composition as in claim 5 wherein the member of said group is sorbitol.

7. A composition as in claim 5 wherein the member of said group is glucose.

8. In a heating device of the type described, for the machineless waving of hair, the element which comprises an absorbent pad containing an oxidizable solution comprising from 70 to 35% by weight of at least one polyoxyethylene ether

6

of a compound selected from the group consisting of hexitols, hexoses, and hexobioses, said ether having from 3 to 100 oxyethylene groups per molecule, from 20 to 50% ethylene glycol, and from 10 to 30% water.

MAISON G. DE NAVARRE.
WILLIAM C. GRIFFIN.

REFERENCES CITED

10 The following references are of record in the file of this patent:

UNITED STATES PATENTS

	Number	Name	Date
15	2,239,410	Bonat	Apr. 22, 1941