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ART OF STABILIZING SOAP

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This invention relates to a method of stabilizing soap with respect to color and odor, and to the resulting product.

As is well known, soap, and especially white soap, tends to become discolored on aging,—as indicated by taking on yellowish or brownish discolorations, streaks or spots,—and also to lose its perfume or otherwise change its odor, often becoming distinctly rancid.

Efforts to overcome these deleterious changes have been made, but have been only casually effective because the conditions causing and tending to promote such changes remained unknown to the art of soap making until our discovery and disclosure of them, as set forth in our copending application for patent Serial No. 325,381, filed December 11, 1928, of which the present application is a continuation in part. In this copending application we showed that certain multivalent metals, namely, copper and iron, when present in the form of cations in the soap, act catalytically to induce and promote the oxidation of some of the constituents of the soap, whereupon discoloration and rancidity ensue. Such metal cations, which appear to be present, at least in minute quantities, in all soaps, may be derived from many sources, including the caustic soda, fats and oils, perfume ingredients, soap making apparatus, containers, and so forth.

Dissociation and ionization of such copper and iron compounds to form cations and anions implies a suitable ionizing and dissociating medium such as water. Water, acting as such a medium, is always present in sufficient amount in the soap mass to allow the formation of copper and iron cations in the presence of the soap. While the principal deleterious metals, as indicated, are copper and iron in the form of free cations, the copper cations are by far the more active and cause the greater damage. Other metals have apparently negligible catalytic effect, if any.

As set forth in our copending application above referred to, copper and iron, while almost always present in soap are normally present in minute amounts which are too small to be detected by ordinary analytical methods, and yet are sufficient to cause serious discoloration and rancidity. For example, if a soap of high purity be prepared which exhibits only a slight tendency to become rancid and as much as two parts of an ionized compound of copper per million parts of soap be added thereto, there quickly results a more serious discoloration and rancidity than would ordinarily be encountered under normal conditions of carefully controlled soap manufacture. The amount of iron cations necessary to cause a like degree of rancidity and discoloration is considerably greater than of copper cations,—e. g., between 10 and 50 times. Hence, it is possible in practice to have a soap in which the content of iron cations is too small to be damaging. But so far as we are aware this is never true of copper cations, which are deleterious in amounts as small as in the order of one part to fifty million parts. In other words, the proportion is so small that it is almost certain to be present regardless of the origin, prior preparations and treatments to which the soap stock has been subjected.

Since the quantities of copper and iron cations which are deleterious to the soap are too minute to be removed by physical means, from the soap mass, it is a question of rendering them harmless in respect of their catalytic activity toward the reactions resulting in the oxidation or rancidity of the soap. Two general methods of procedure are described in the foregoing application, that is, by precipitation in the form of extremely insoluble compounds or by reaction to form complex compounds, in which form they no longer produce free metal cations and hence become inactive.

The present invention relates to an improvement of the process according to the second method of procedure, as thus defined. To this end, it is an object of this invention to improve the second type of method of treating soap to inhibit and prevent rancidity and discoloration, by means of a readily available reagent or reagents, other than those described in said copending application. Other objects will appear from the disclosure.

While a number of reagents have been found which to some extent stabilize soap by acting as complex-formers, we have found by extensive study of hundreds of materials, both organic and inorganic, that only a very few are really effective to stabilize soap against both color and odor changes and to maintain fully such stability over long periods of time. Aside from these very few excellent stabilizers, we have found that other materials which have been considered as stabilizers or rancidity preventers are unsatisfactory in that they are only partially effective, or they may preserve the odor but injure the color, or their effectiveness is quickly lost on passage of time. The complex-formers of this invention have none of these drawbacks; but, in addition to the reagents mentioned in our copending application above referred to, they constitute the few practical, complete and permanent reagents of the complex-forming type of which we are aware.

The complex forming reagents which we use in accordance with the present invention are, for example, glutamic and aspartic acids and their metallic salts or direct acid addition products.

Glutamic and aspartic acids are amphoteric; they form compounds with relatively strong alkalies or acids. For example, with sodium or potassium hydroxide, sodium or potassium glutamate (or aspartate) will be formed; with hydrochloric or sulfuric acid, glutamic (or aspartic) acid hydrochloride or sulfate will be formed. This latter type of compounds is referred to herein as acid-salts of glutamic (or aspartic) acid.

In any case, the use of glutamic or aspartic acid or compounds thereof, or mixtures of these, will introduce the radical

$$-OOC-(CH_2)_n-\underset{\displaystyle NH_2}{\underset{|}{CH}}-COO-$$

where $n=1$ for aspartic acid and its compounds and $n=2$ for glutamic acid and its compounds. Thus, sodium aspartate is represented by

$$NaOOC-CH_2-\underset{\displaystyle NH_2}{\underset{|}{CH}}-COONa$$

glutamic acid hydrochloride is represented by

$$HOOC-(CH_2)_2-\underset{\displaystyle NH_2.HCl}{\underset{|}{CH}}-COOH.$$

Omitting the HCl from the latter formula gives the formula for glutamic acid.

Our preferred stabilizing reagent may be added at any convenient step in the soap-making process where it may be thoroughly and evenly incorporated into the soap. For example, it may be added to the neat soap as made in the kettle, in the manufacture of frame soap; in the manufacture of milled soap it may be similarly added, although it is ordinarily better to add it to the mixer (which precedes the milling), at which point perfume materials and coloring agents are also conventionally added. The amount of stabilizing agent added is about 0.03% of the weight of the soap (on a dry basis); this amount may be varied to suit the circumstances and requirements but will fall generally in the range of 0.01% to 0.20% of the weight of dry soap. Addition of the stabilizer as a water solution thereof permits more thorough and uniform incorporation throughout the soap, although it is not absolutely necessary to add it in that way. While smaller amounts of stabilizer may be effective, it is preferable to use amounts within the range specified as such amounts, theoretically in excess of the quantity necessary to form complexes with the copper and iron present, provide a reserve of complex-forming material against emergencies such as unexpected excesses of deleterious metal cations in the soap, contamination from further handling, wrappers, etc., and other factors. The excess of stabilizer also protects against effects of any lack of uniformity in the mixing and milling operations,—for no matter how thorough these may be, they can hardly be expected to make a product whose homogeneity is perfect throughout.

We have found that, of the stabilizers of this invention, the hydrochlorides of glutamic and aspartic acids are the best, although the acids themselves are very nearly as effective. The alkali salts of the acids are somewhat less effective than the acids and their hydrochlorides. All of these salts and compounds, however, are greatly superior to the compounds such as aromatic amines, sulfanilates, hydroxy-diphenyls, formaldehyde, etc., which have hitherto been proposed as anti-oxidants or reducing agents. Some of the latter are only temporarily effective while others are objectionable for various reasons,—for example, some introduce quite undesirable properties when used with the highest grades of soaps.

The stabilizers of this invention are sharply distinguished from such so-called anti-oxidants. The latter are generally unsaturated organic compounds which are easily oxidized as compared with the materials in which they are incorporated. They therefore for a time take up oxygen themselves, and more or less prevent it from deleteriously affecting the soap or other material. But after the anti-oxidant has become saturated, or has otherwise functioned to the extent of its capacity, it no longer offers any protection, and may in fact promote oxidation, so that thereafter the material in which it is incorporated quickly becomes discolored and rancid. In contrast to such action, the stabilizers of this invention operate by eliminating the cause of oxidation and the resulting discoloration and rancidity,—that is, they eliminate the copper and iron cations as such by converting them into harmless complexes in which they are no longer present in active or cationic form.

We claim:

1. The art of stabilizing soap against rancidity and discoloration induced by copper and iron cations, which act catalytically to promote oxidation of ingredients of the soap, which comprises incorporating in the soap a reagent containing the radical of the formula

$$-OOC-(CH_2)_n-\underset{\displaystyle NH_2}{\underset{|}{CH}}-COO-$$

in which $n=1$ or 2 in sufficient amount completely to react with the copper and iron cations contained in the soap to be treated.

2. The art of stabilizing soap against rancidity and discoloration induced by copper and iron cations, which act catalytically to promote oxidation of ingredients of the soap, which comprises incorporating in the soap a free acid of the formula

$$HOOC-(CH_2)_n-\underset{\displaystyle NH_2}{\underset{|}{CH}}-COOH$$

in which $n=1$ or 2 in sufficient amount completely to react with the copper and iron cations contained in the soap to be treated.

3. The art of stabilizing soap against rancidity and discoloration induced by copper and iron cations, which act catalytically to promote oxidation of ingredients of the soap, which comprises incorporating in the soap an acid-salt of a compound containing the radical of the formula

$$-OOC-(CH_2)_n-\underset{\displaystyle NH_2.R}{\underset{|}{CH}}-COO-$$

in which $n=1$ or 2 and R represents an acid in sufficient amount completely to react with the copper and iron cations contained in the soap to be treated.

4. The art of stabilizing soap against rancidity and discoloration induced by copper and iron cations, which act catalytically to promote oxidation of ingredients of the soap, which comprises incorporating in the soap a soluble metal salt of an acid having the formula

$$HOOC-(CH_2)_n-\underset{\displaystyle NH_2}{\underset{|}{CH}}-COOH$$

in which $n=1$ or 2 in sufficient amount complete-

ly to react with the copper and iron cations contained in the soap to be treated.

5. The art of stabilizing soap against copper and iron cations which act catalytically to promote oxidation of ingredients of the soap, which comprises adding to the soap mass during manufacture a sufficient amount of reagent selected from the group consisting of glutamic acid, aspartic acid, the acid-salts thereof, and the soluble metal salts thereof, completely to react with the copper and iron cations contained in the soap to be treated.

6. Soap stabilized against rancidity and discoloration by the presence therein of a sufficient amount of a compound containing the radical of the formula

$$-OOC-(CH_2)_n-\underset{\displaystyle NH_2}{\underset{|}{CH}}-COO-$$

in which $n=1$ or 2, completely to react with the copper and iron present therein.

7. Soap containing a stabilizing agent comprising a sufficient amount of a compound selected from the group consisting of glutamic and aspartic acids, the acid salts thereof and the soluble metal salts thereof, completely to react with the copper and iron present therein.

8. That step in the process of making milled soap which consists in adding glutamic acid hydrochloride to the soap mass during the mixing operation preceding the milling, in sufficient amount completely to react with the copper and iron present therein.

9. Soap stabilized against rancidity and discoloration by the presence therein of a sufficient amount of a free acid of the formula

$$HOOC(CH_2)_n-\underset{\displaystyle NH_2}{\underset{|}{CH}}-COOH$$

in which $n=1$ or 2, completely to react with the copper and iron present therein.

10. Soap stabilized against rancidity and discoloration by the presence therein of an acid-salt of a compound containing the radical of the formula

$$-OOC(CH_2)_n-\underset{\displaystyle NH_2.R}{\underset{|}{CH}}-COO$$

in which $n=1$ or 2 and R represents an acid, in an amount sufficient completely to react with the copper and iron present therein.

11. Soap stabilized against rancidity and discoloration by the presence therein of a sufficient amount of a soluble metal salt of an acid having the formula

$$HOOC(CH_2)_n-\underset{\displaystyle NH_2}{\underset{|}{CH}}-COOH$$

in which $n=1$ or 2, completely to react with the copper and iron present therein.

12. Soap stabilized against rancidity or discoloration by the presence therein of glutamic acid hydrochloride, in an amount sufficient completely to react with the copper and iron present.

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