United States Patent Office 2,792,348 Patented May 14, 1957

2,792,348

SOAP COMPOSITION

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No Drawing. Application October 21, 1952, Serial No. 316,067

5 Claims. (Cl. 252—132)

This invention relates to a process for the manufacture of solid soaps such as are produced in the forms of bars, flakes or powder.

In the manufacture of soaps to be sold in solid form, it is necessary to achieve a certain degree of hardness to prevent distortion during shipping or to prevent adhesion of flakes or power under extremes of temperature or when accidently subjected to pressure. To achieve these results, it has generally been necessary either to (*a*) limit the type of fat or fatty acids to those having a high titer, or having a high ratio of solid or saturated fatty acids to liquid or unsaturated fatty acids, or (*b*) if lower titer fats, which in the trade are considered as those having a high content of unsaturated acids, are employed, it is necessary to dry the soaps to a very low moisture content in order to achieve the requisite hardness. The soap maker, therefore, is limited either in his choice of materials or in the manufacturing methods which he can use to produce solid products. The use of high titer fats or fatty acids presents no manufacturing difficulties but on the other hand, the resulting soaps are less soluble in water and often, therefore, less usable for textile applications than the low titer soaps. The low titer fats or fatty acids produce soaps which are much more water soluble, more easily rinsed and ideally suited for many textile applications. However, in using these fats, manufacturing difficulties are encountered in that special drying equipment is necessary in order to reduce the moisture content to the point where such soaps are sufficiently solid to retain their flake form during handling and shipping.

It is one purpose of this invention to provide a process by which soaps of low titer fatty acids can be prepared with conventional soap-drying equipment, that is, without the necessity of drying the soap to abnormally low moisture contents.

It is the second purpose of this invention to provide a process by which soaps from fatty acids of the titer normally used for this purpose may be produced in solid form with a higher moisture content than ordinarily would be feasible.

It is the third purpose of this invention to provide a process which will permit the production of soap flakes and powders which, for a given moisture content are tougher, less friable and having less tendency to powder than products produced by the conventional methods.

I have found that these purposes can be accomplished by incorporating the sodium salts of dibasic acids, i. e. aliphatic dicarboxylic acids, with the ordinary fatty acid soaps in the process of manufacture. The addition of these salts of dibasic acids will produce a harder soap from a given fatty acid or fat and at a given moisture content than will be produced from the same fatty acids or fat, without the use of dibasic acid salts. Likewise, hard soaps can be produced from low titer fats with a moisture content of from 8% to 10%, which soaps normally

would have to be dried to a moisture content of from 2% to 4% in order to avoid stickiness.

In the practice of this invention, I have found that dibasic acids containing from 3 to 10 carbon atoms, either straight or branch chain, may be employed. This includes such acids as malonic, succinic, adipic, azelaic and sebacic and side-chain acids such as methyl adipic. The quantity of dibasic acid which is required depends, of course, to a certain extent upon the degree of hardness which is desired or upon the increased moisture content which may be necessary and which, in turn, is dependent upon the type of drying equipment which is available. From 1% to 10% dibasic acids may be employed but generally, from 1% to 3%, based upon the weight of fat or fatty acid, is sufficient to produce the desired results.

The salts of the dibasic acids may be incorporated in the soap by any one of several methods. If the soap is being prepared from fatty acids, the dibasic acid may be dissolved in the fatty acid prior to saponification, in which case the dibasic acids are preferably those of longer chain length which are more soluble in fatty acids or as alternatives the dibasic acid may simply be suspended in the fatty acid prior to the addition of caustic. In fact, special soap making fatty acids may be blended by the fatty acid manufacturer and shipped to the soap manufacturer. Still a third method would consist of simply adding the sodium salt of the dibasic acid to the soap which has already been formed in suitable mixing equipment, such as a soap crutcher.

If the soap is to be prepared from fat, the dibasic acid should not be added until after the saponification is complete and any soap lyes or salt water washes have been withdrawn in order to avoid loss of the dibasic acid salts in the water solutions.

In practicing this invention any water-soluble salt of the dibasic acids may be used and any of the conventional alkalies may be used for the formation of the fatty soap. However, since the sodium soaps are generally harder than the potash or ammonium soaps, it is obvious that this invention is particularly directed to the ordinary soda soaps and that there would be no particular advantage in using any salt of the dibasic acid other than the sodium salts. It should be understood, however, that even though the sodium salts are those which, from practical consideration, would be used, the scope of our invention is not so limited. The process of our invention is illustrated by the following examples:

Example 1.—Soaps of tallow fatty acids

A soap was prepared by adding 60.3 parts of tallow fatty acids heated to 65° C. to a solution consisting of .3 part of sodium chloride and 8.7 parts of sodium hydroxide dissolved in 30.7 parts of water, also heated to 65° C., with agitation and continued mixing until uniform. The soap thus prepared was cast into a rectangular mold and allowed to cool.

A soap was also prepared in a similar manner from the same fatty acids, except that malonic acid was incorporated in the soap. In this case 60.3 parts of tallow fatty acids and a solution consisting of .3 part of sodium chloride, 9.1 parts of sodium hydroxide, 30.3 parts of water and .6 part of malonic acid was used. The additional sodium hydroxide used in this formula was used for the purpose of forming the sodium salt of the malonic acid used.

The relative hardness of these soaps was determined by the use of a modified Mullen paper tester in which the conventional open ring of the Mullen tester was replaced by a flat metal surface. The readings represented the pressure in pounds per square inch as read on the Mullen gauge required to fracture the bars. With this device, a pressure of 15 to 20 pounds indicates a soft

jelly-like consistency. A reasonably firm bar of soap is represented by a reading of 30 to 50 pounds. Freshly-prepared commercial soaps may show readings ranging from 50 to 100.

When tested with this equipment, the soap prepared without the addition of malonic acid fractured at 38 pounds while the composition containing .6 part, or 1.0%, based on the weight of tallow acids, of malonic acid fractured at 73 pounds' pressure.

Example 2.—Soaps of cottonseed fatty acids

Soaps of cottonseed fatty acid were prepared as described in Example 1. Their compositions consisted of:

	Formula A	Formula B
Cottonseed fatty acids	60.3	60.3
Sodium chloride	.3	.3
Sodium hydroxide	8.3	8.9
Water	31.1	29.3
Adipic acid	None	1.2

The soap containing 1.2 parts of adipic acid (Formula B—2% of weight of the fatty acid) was substantially harder than the soap without the addition of adipic acid (Formula A). The Mullen tests were 61 and 24 respectively. The soap without adipic acid was too soft to be considered a satisfactory bar; the soap with adipic acid was well within the range of commercial bar soap.

Example 3.—Oleic acid soaps

Using the same procedure as described in Example 1, soaps were prepared from commercial oleic acid in accordance with the following formulae:

	Formula A	Formula B
Oleic Acid	60.3	60.3
Sodium hydroxide	8.6	11.1
Water	31.1	22.6
Azelaic Acid	None	6.0

Formula A soap showed a Mullen test of 19 pounds and Formula B of 84 pounds.

Example 4.—Built tallow soaps

Soap A was prepared by dissolving 6.7 parts of sodium hydroxide in 21.0 parts of water and after heating this solution to approximately 65° C. adding with stirring 47.3 parts of tallow fatty acids. After mixing and stirring until homogenous, 25 parts of sodium silicate (40° Bé.) was added and mixing continued until uniform.

Soap B was prepared from the same fatty acids with the addition of .9 part of adipic acid which was dissolved in the tallow acids. 7.1 parts of sodium hydroxide was used dissolved in 19.7 parts of water and 25 parts of sodium silicate was incorporated after saponification.

Soap A showed a Mullen test of 33 while Soap B was substantially harder, giving a test of 51 pounds.

Example 5.—Oleic acid flake soaps

Three soaps were prepared from commercial oleic acid by the process described in Example 1. The compositions used were:

	Formula A	Formula B	Formula C
Commercial oleic acid	65.0	63.7	63.7
Sodium hydroxide (50% sol.)	18.8	19.8	19.6
Sodium chloride	.3	None	None
Adipic Acid	None	1.3	None
Azelaic Acid	None	None	1.3
Water	15.9	15.2	15.4

These soaps were passed through a flaking mill until the flakes were no longer sticky and gummy. It was found that it was necessary to dry the Formula A soap which contained no dibasic acids to 3–4% moisture content to avoid sticky flakes. The soaps containing adipic or azelaic acids, when dried to the point of non-stickiness, were found to contain from 8 to 10% of moisture. Drying to the 8 to 10% moisture level, which was all that was required for the soaps containing adipic or azelaic acid, was much less difficult than drying the soap without added dibasic acids to a 2–4% moisture content.

It was also observed that the flakes containing dibasic acid salts, that is Formulae B and C were tougher and less friable than those produced by Formula A.

My invention may be employed with soaps derived from all types of fatty monocarboxylic acids ranging in chain length from C12 to C22. It may be employed with soaps of saturated fatty acids but since such fatty acids yield soap of sufficient hardness for most purposes, it is particularly adapted for use with the soaps of unsaturated fatty acids such as oleic acid or linoleic acid, and with soaps produced from fatty oils containing a large percentage of these acids such as corn oil, soya bean oil, olive oil and the like.

Having described my invention, I claim:

1. A solid fatty acid soap consisting essentially of the sodium salt of an unsaturated, monocarboxylic fatty acid and from one to ten percent by weight of the sodium salt of a dicarboxylic acid having 3 to 10 carbon atoms, based on the weight of the fatty acid content.

2. The fatty acid soap set forth in claim 1 wherein the amount of the sodium salt of the dicarboxylic acid is from one to three percent.

3. The fatty acid soap set forth in claim 1 wherein the unsaturated, monocarboxylic fatty acid is oleic acid.

4. The fatty acid soap set forth in claim 1 wherein the unsaturated, monocarboxylic fatty acid is tallow fatty acid.

5. The fatty acid soap set forth in claim 1 wherein the unsaturated, monocarboxylic fatty acid is cottonseed fatty acid.

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