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MANUFACTURE OF SOAP

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My invention relates to the art of soap making and more especially to a process for the manufacture of powdered or molded soaps which are free from alkaki carbonate and do not effloresce.

It is known to those skilled in the art of soap manufacture, that fatty acids free from neutral fat can be converted in a very short time with dry calcined soda in powder form into a homogeneous soap. The fatty acid must be as free from water as possible; the mixture with the soda must take place at a temperature only slightly exceeding the melting point of the fatty acid and an amount of soda exceeding the quantity theoretically necessary for saponification must be used, but if it is desired to obtain soda-free soaps, double the theoretical amount should not be exceeded or should be only slightly exceeded. In addition to a completely water-free soap, neutral sodium bicarbonate is formed in the reaction.

The difficulties encountered in this profiitable saponification process are that one is limited to the use of fatty acids having a not too high iodine value and that for the transformation of the saponification products into readily soluble products such as flakes, strips, chips and threads and also for the manufacture of ground and pressed soaps one must admix some other liquid, water-containing soap. For, if fatty acids with a higher iodine value are employed, the soaps obtained, owing to their neutral character and their deficiency in water, very easily become rancid or, if they are unsuitably stored in large quantities, oxidize to such an extent that they may even become completely carbonized. The lack of plasticity and softness of the product must be obivated by the addition of considerable amounts of water-containing soaps, for example liquid curd soap. This process, however, requires a circumstantial mixing operation and necessitates a frequent passing of the mixture through the pressure rollers.

I have now found that the aforesaid disadvantages can be obviated if water in quantities of about 2–50% calculated on the fatty acid, and preferably at room temperature is added in a suitable manner to the mixture of fatty acids and calcined soda or potash. This addition also brings about a more rapid saponification and leads to altogether homogenous products with a water content which can be accurately adjusted and which are capable of being comminuted without any drying or further addition of water. The reaction produdcts can also be mixed as desired, with anhydrous or water-containing liquid or solid soaps, saponification products, other dispersing or wetting agents, paraffin, vaseline, waxes, solvents, per-compounds or other of the usual additions or filling agents which are added to soap.

The amount of water added varies within wide limits and is dependent on the kind of soap (whether it is a potash or a soda soap, and whether from liquid or solid fatty oils), on whether salts are used as well, on the kind of molding, and on the later admixture of curd or filled soaps which may take place. In the case of soda soaps 20–30% at the most is taken, while with potash soaps the amount is from 2–5%.

Instead of pure water, salt solutions may be employed and thereby a soap having a definite addition of salt can be manufactured. For this purpose, salts are added in any suitable proportion which do not decompose the bicarbonate. The water or the aqueous salt solution can only be added to the mixture of fatty acid and alkali carbonate without impairing the saponification process, while at the same time obtaining uniform and compeltely saponified products, when the mixture of the two is an altogether homogeneous one. I have found that contrary to expectations very considerable amounts of water or aqueous salt solutions can be added without separation of the constituents and without the homogenity of the saponified mass being impaired. On the contrary with these additions as a rule a far more homogeneous product is obtained than without them. Oxidizing or reducing bleaching agents such as sodium perborate, sodium hypochlorite, sodium hydrosulphite, sodium persulphate or the like may be added to the water or to the salt solutions which are added during the saponification.

When operating without an addition of water and salt trouble is experienced even in the case of charges containing more than 300–500 kgs of fatty acid, owing to insufficient mixing and the tendency to strong internal overheating. For this reason, the soap from the mixing vessel which was spread on the floor had hitherto to be broken up with the spade as quickly as possible in order to effect better cooling, since otherwise a strong discoloration occurred or, if soft fats with a medium iodine value were used, combustion even took place. In contradistinction thereto, if water or aqueous salt solutions are added during the saponification process, any desired charges of fat of several thousand kilograms can be stirred up at a time and can be spread on the floor without being broken up because

overheating owing to oxidation is no longer to be feared. Further, the stirring mechanism may be of considerably lighter construction since the reaction mass is considerably less brittle than one without the additions. The new process further makes me independent in the choice of raw materials. By it for example ground soap can be manufactured solely from coconut oil fatty acid or solely from hard fats or also only from soft fats, so that I am not limited in the choice of material and can select it to suit market conditions.

With the addition of water or of salt solutions the above process also proceeds so smoothly and completely that it may even be carried out continuously. In this case I proceed in such a way that, after the fatty acid has been mixed with the alkali carbonate and the water or salt solution added, the solidified reaction mass which is no longer sticky is passed, for example through a mill in order to convert it into thin, fine strips. The mass thereby becomes so homogeneous that a quantitative saponification is completed in an astonishingly short time. The mass at the same time heats up so strongly that it still remains plastic for some time during which it can be shaped into bars or pieces or also into bands, chips, flakes or threads in an entirely continuous manner. In special cases I may also heat the rolls during the first part of the process or I may shortly before the molding, if necessary, cool the reaction mass down again to the most suitable molding temperature by cooling the rolls. I have even found that in this continuous process, even if the saponification process has not yet proceeded absolutely quantitatively, an after-saponification occurs within a few hours which in no way impairs the appearance of the product which, no doubt, is mainly due to the fact that the water and the carbonic acid formed during the saponification reaction are consumed quantitatively in the formation of alkali bicarbonate. Cracking or efflorescence of the molded products does not occur. Instead of rolls worms may be used for the further treatment of the mixture.

It is true that in the known process the attempt has already been made to mix fatty acids with soda containing up to 30% water of crystallization but this process has not proved successful in practice. For the moment when the addition of water is made, is of decisive importance. If the water is present right from the start, insuperable difficulties oppose the smooth course of the saponification. In the first place its is very difficult to manufacture a soda in the form of a fine powder which contains water of crystallization such as is necessary for a sufficiently thorough mixture. Such a soda further cakes together again after quite a short time and must be ground and sieved afresh before each saponification operation. Finally saponification takes place so quickly with soda containing water of crystallization that the previous thorough and uniform mixing, which is absolutely necessary, cannot be obtained. There are therefore formed useless mixtures of soda, soap, fatty acids and bicarbonate.

I will now proceed to describe the new method of saponification according to the present invention. In a vessel which is made, for example, of aluminium and has an efficient and suitable stirring mechanism the fatty acid is very thoroughly mixed in a short time at a temperature of about 30–35° C. with double the amount of calcined soda necessary for the saponification. Thereupon water, however not more than one half of that calculated on the amount of fatty acid employed, is quickly poured in whereby the whole mass is rapidly heated up and saponified within about two minutes to form a soft product. When this product has solidified under stirring to such an extent that it no longer cakes on the walls, the vessel is emptied and a new charge is introduced into it. It is more advantageous to use salt solutions instead of water or, if one desires to obtain, for example later after the addition of curd or filled soap, a product which is capable of being comminuted without drying, suitable salts dissolved in their own water of crystallization. After some hours and sometimes on the next morning the soap can be molded with or without further addition of liquid curd or filled soaps, either according to the grinding process into the form of skeins or pieces, or can be converted in a known manner into strips, chips, flakes or threads or ground to powder. If soda-free neutral soaps shall be obtained, only those salts should of course be employed which do not decompose alkali bicarbonate. For this purpose sodium bicarbonate, disodium phosphate, neutral sodium pyrophosphate or borax are particularly suitable. The addition of the said phosphates moreover exercises a stabilizing effect on the products. If salts which decompose bicarbonate were employed, alkali carbonate would again in part be formed, so that the soap would not only assume an alkaline character, but would also not be stable in contact with the air and would exhibit efflorescence.

Obviously, during the saponification process any desired fat solvents and also resinic acids may be added to the fatty acids, and the soda may be replaced by equimolecular quantities of potash or mixtures of soda and potash. The admixture of fat solvents is particularly to be recommended when the fatty acid to be employed has a too high melting point. As low a moisture content in the fatty acid as possible is of importance in order that the intimate mixing may be carried out without the saponification process being started too soon by any moisture which may be present. The new process is the only process known up till now by which solid, shaped and homogeneous soaps having a hydrocarbon content can be obtained without a drying process being required, which will always lead to a loss of hydrocarbons.

The properly manufactured soaps contain only sodium bicarbonate and are practically neutral. They are therefore particularly suitable, for washing, more especially at room temperature or at a somewhat higher temperature, sensitive fabrics above all wool and silk, and also for bodily use. When washing linen, i. e. under boiling, the sodium bicarbonate is decomposed into sodium carbonate and carbon dioxide which develops slowly in the material under treatment and greatly contributes to the quick and complete removal of the dirt which has been loosened. By the formation of bicarbonate or the addition of salt solutions the fatty acid content is reduced as compared with that of the pure soaps which is desirable for many purposes on technical grounds. In other cases the fatty acid content can again be increased by the admixture of pure, solid and liquid filled or curd soap.

In practicing my invention, I may for instance proceed as follows:

Example 1

400 kgs. of distilled fatty acid consisting of
33% palm oil faty acid,
33% palm kernel oil fatty acid,
34% earth nut oil fatty acid,

are mixed at 30–35°C in a suitable mixing vessel of aluminium or silumin with 168 kgs of calcined soda of 99% which takes about 1 minute. After this 100 kgs of water are added, whereupon the mass solidifies within a further minute, forming a white soap which no longer sticks together and can be easily detached from the walls of the vessel. The vessel is easily emptied by tipping without any remainder being left therein. After the addition of 0.2% of a rose perfume the saponified mass may then be banded one to two times and may be pressed directly in a single operation into smooth, glossy strands, threads, flakes, chips or the like. The soap dissolves clearly at 34–40°C and has a turbidity point of 31°. The fatty acid content of the soap amounts to 70–71%. The pieces obtained from the strands by pressing exhibit a beautiful lustre, remain unchanged in contact with air and possess a high foaming and cleaning power.

Example 2

400 kgs distilled fatty acid, composed of
30% palm oil fatty acid,
30% palm kernel oil-coconut oil fatty acid,
40% earth nut oil fatty acid,

are intimately mixed for about 1 minute at a temperature of 30–35°C and with the addition of some perfume with 168 kgs calcined soda of 99%, after which the mass is altogether homogeneous. Now 100 kgs water, into which 12 kgs sodium bicarbonate and 4 kgs tylose have previously been stirred at about 30–60°C, are added, whereupon an almost complete saponification takes place at once, the temperature rising from 30° to 75–80°C. The mass can be banded at once and then shaped, as in Example 1, to form strands, pieces, threads, flakes or the like.

Example 3

To 400 kgs distilled fatty acid as indicated in Example 2 are added 40 kgs cyclonol or a similar hydrocarbon and 168 kgs calcined soda of 99% are then mixed therewith in a suitable mixing vessel. The mass which is now altogether homogeneous, is treated with 50 kgs water and may then further be shaped at once, as indicated with regard to Examples 1 and 2.

There are obtained in this manner either beautiful, glossy stable refined pieces or threads, flakes and the like which already at 25–30°C dissolve clearly in water and exhibit a very good foaming power and contain 69.0% fatty acid plus hydrocarbons.

Example 4

400 kgs distilled fatty acid of the composition given in Example 2 are mixed at 30–35°C with 168 kgs calcined soda of 99% and are saponified under addition of 50 kgs water and a suitable perfume which takes 1–2 minutes. The mass is then mixed in a kneading machine with 600 kgs dry base soap with the addition of 22 kgs of a tylose paste of 10% whereafter 40–50 kgs disodium phosphate which has been dried by centrifuging and melted in its own water of crystallization are added. The well mixed mass is then banded and can be directly pressed to form beautiful bars or glossy pieces or can also be shaped into fine threads or rolled into flakes or the like. The products have a glossy surface, are stable in contact with the air, wash and foam well and have a fatty acid content varying between 69 and 70%.

Example 5

400 kgs distilled palm oil fatty acid as indicated in Examples 1 and 2 are well mixed at 32–35°C with 220 kgs ground potash of 96–98% whereafter 10–20 kgs water are added. The saponification is complete within a minute and the soap obtained is at once banded and after a short storage can be well and easily pressed into the form of threads or bands or flakes.

The products are short and not hygroscopic and quickly and readily dissolve in water. The turbidity point is about 42°C.

Various changes may be made in the details disclosed in the foregoing specification without departing from the invention or sacrificing the advantages thereof.

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