Investigation of Foaming Capacity of Different Washing Soap

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Abstract- **Aim is to investigate foaming capacity of different washing soap and effect of addition of sodium carbonate on them. Soaps and detergents are cleaning ingredients that are able to remove oil particles from surfaces because of their unique chemical properties. Soaps are created by the chemical reaction of a jetty acid with on alkali metal hydroxide. In a chemical sense soap is a salt made up of a corboxylix acid and an alkali like sodium of potassium. The cleaning action of soap and detergents is a result of thrill, ability to surround oil particles on a surface and disperse it in water.**

Index terms- **Foam, Detergent, soap, chemicals**

INTRODUCTION

Bar soap has been used for centuries and continues to be an important product for batching and cleaning. It is also a mild antiseptic and ingestible antidote for certain poisons. SOAP is a common term for a number of related compounds used as of washing clothes or bathing. Soaps are sodium or potassium salts of higher fatty acids such as stearic acid (C17 H35 COOH), politic acid (C15 H31 COOH) and oleic acid (C17H35 COOH) they have the general formula RCOONa and RCOONa. Soap is produced by a saponification or basic hydrolysis reaction of a fat or oil. Currently sodium carbonate or sodium hydroxide is used to neutralize the fatty acid and convert it to the salt.

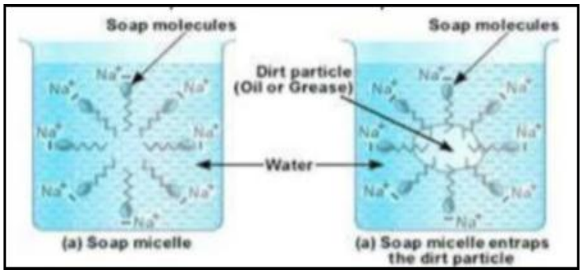
MATERIAL REQURED

a. Apparatus Five 100ml conical flasks, five 20ml test tubes, 100ml measuring cylinder, test tube stand, weight box and stop watch.
b. Chemicals Five different samples of soap and distilled water.

THEORY

There is no quantitative method for the determination of foaming capacity of soap. The foaming capacity of soap depends upon concentration of soap in the sample. Solution of different soap is prepared by dissolving their equal weights in equal volumes of distilled water. These solutions are shaken vigorously to produce foam and then they are allowed to stand.
Time taken for the disappearance of foam is measured for different samples. Longer the time taken for the disappearance of foam in a given sample of soap, greater is its foaming capacity.
The foaming capacity of a soap sample depends upon the nature of soap and its concentration. This can be compared for various samples of soaps by taking the same concentration of solution and shaking them. The foam is formed and the time taken for disappearances of foam in all cases is compared. The lesser the time taken by a solution for the disappearance of foam, the lower is its foaming capacity.
When soap is shaken with water it becomes a soap solution that is colloidal in nature. Agitating it tends to concentrate the solution on the surface and causes foaming. This helps the soap molecules make a unimolecular film on the surface of water and to

penetrate the fabric. The long non-polar end of a soap molecule that are hydrophobic, gravitate towards and surround the dirt (fat or oil with dust absorbed in it).The short polar end containing the carboxylate ion, face the water away from the dirt. A number of soap molecules surround or encircle dirt and grease in clustered structure called 'micelles', which encircles such particles and emulsify them.



Procedure

Five conical flasks (100 ml each) are taken and numbered 1 to 5. In each of these flasks equal amounts (say 5 gm) of the given samples of soap shavings or granules are taken and 50 ml of distilled water is added. Each conical flask is heated few minutes to dissolve all the soap completely. In a test-tube stand, five big clean and dry test tubes are taken and numbered 1 to 5 One ml of the five soap solution is then poured in the test tubes of corresponding number. 10 ml. of distilled water is then added to each test tube. Test tube no 1 is then shaken vigorously 5 times. The foam would be formed in the empty space above the container. Stop watch is started immediately and the time taken for the disappearance of foam is noted. Similarly the other test tubes are shaken vigorously for equal number of times (i.e., 5 times) with approximately with the same force and the time taken for the disappearance of foam in each case is recorded. The lesser the time taken for the disappearance of foam, the lower is the foaming capacity.

TYPES OF SOAP

The type of fatty acid and length of the carbon chain determines the unique properties of various soaps. Tallow or animal fats give plimarily sodium stearate (18 carbons) a very hard, insoluble soap. Fatty acids with longer chains are even more insoluble. As a matter of fact, 3inc stearate is used in talcum powders because it is water repellent. Coconut oil is a source of lauric acid (12 carbons) which can be made into sodium lourate. This soap is very soluble and will lather easily even in sea water. Fatty acids with only 10 or fewer carbons are not used in soaps because they irritate the skin and have objectionable odors

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The general formula of soap is Fatty end water soluble end CH3-(CH2) n COONa Soaps are useful for cleaning because soap molecules have both hydrophilic end, which dissolves in water, as well as hydrophobic end, which is able to dissolve on polar grease molecules. Applied to a soiled surface, soapy water effectively holds particles in colloidal suspension so it can be rinsed off with clean water. The hydrophobic portion (made up of a long hydrocarbon chain) dissolves dirt and oils, while the ionic end dissolves in water. The resultant forms a round structure called micelle. Therefore, it allows water to remove normally-insoluble matter by emulsification.

Commercial production of soap the most popular soap making process today is the cold process method, where fats such as olive oil react with strong alkaline solution, while home stayers use the historical hot process. Handmade soap differs from industrial soap in that, usually, an excess of fat is sometimes used to consume the alkali (super fatting), and in that the glycerin is not removed, leaving a naturally moisturizing soap and not pure detergent. Often, emollients such as jojoba oil osha butter are added at trace (the point at which the saponification process is sufficiently advanced that the soap has begun to thicken), after most of the oils have specified, so that they remain unreacted in the finished soap. Fat in soap is derived from either vegetable or animal fats.

Sodium Tallow ate, a common ingredient in much soap, is derived from rendered beef fat. Soap can also be made of vegetable oils, such as palm oil, and the product is typically softer. An array of saponifiable oils and fats are used in the process such as olive, coconut, palm, cocoa butter to provide different qualities. For example, olive oil provides mildness in soap; coconut oil provides lots of lather; while coconut and palm oils provide hardness. Sometimes castor oil can also be used as an ebullient. Smaller amounts of unspecifiable oils and fats that do not yield soap are sometimes added for further benefits. Preparation of soap In cold-process and hot-process soap making, heat may be required for saponification. Cold-process soap making takes place at a sufficient temperature to ensure the liquification of the fat being used.

Unlike cold-processed soap, hot-processed soap can be used right away because the alkali and fat specify more quickly at the higher temperatures used in hot-process soap making. Hot- process soap making was used when the purity of alkali was unreliable. Cold-process soap making requires exact measurements of alkali and fat amounts and computing their ratio, using saponification charts to ensure that the finished product is mild and skin-friendly. Hot process In the hot-process method, alkali and fat are boiled together at 80100 C until saponification occurs, which the soap maker can determine by taste or by eye. After saponification has occurred, the soap is sometime sprecipitated from the solution by adding salt, and the excess liquid drained off.

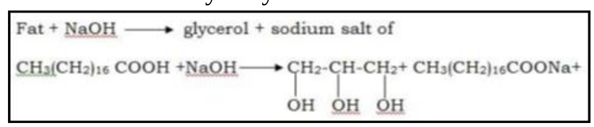
The hot, soft soap is then spooned into a mold. Cold process A cold-process soap maker first looks up the saponification value of the fats being used on a saponification chart, which is then used to calculate the appropriate amount of alkali. Excess unreacted alkali in the soap will result in a very high pH and can burn or irritate skin. Not enough alkali and the soap are greasy. The alkali is dissolved in water. Then oils are heated, or melted if they are solid at room temperature. Once both substances have cooled to approximately 100-110F (37-43C), and are no more than 10F (~5.5C) apart, they may be combined. This alkali-fat mixture is stirred until trace. There are varying levels of trace. After much stirring, the mixture turns to the consistency of a thin pudding. Trace corresponds roughly to viscosity. Essential and fragrance oils are added at light trace. Introduction to the experiment Soap samples of various brands are taken and their foaming capacity is noticed. Various soap samples are taken separately and their foaming capacity is observed.

The soap with the maximum foaming capacity is thus, said to be having the best cleaning capacity. The test requires to be done with distilled water as well as with tap water. The test of soap on distilled water gives the actual strength of the soaps cleaning capacity. The second test with tap water tests the effect of Ca2+ and Mg2+ salts on their foaming capacities.

OBJECTIVE

To compare the foaming capacity of various soaps

General Overall Hydrolysis Reaction



Although the reaction is shown as one step reaction, it is in fact two steps. The net effect as that the ester bonds all broken. The glycerol turns back into an alcohol. The fatty acid is turned into a salt due to the presence of a basic solution of NaoH. In the carboxyl group, one oxygen now has a negative charge that attracts the positive sodium ion. A molecule of soap consists of two parts.

a) Alkyl group – it is oil soluble

b) Corboxyl group – It is water soluble

Sodium carbonate Effect

Sodium carbonate (also known as washing soda, soda crystals or soda ash), Na2 CO3, is a sodium salt of carbonic acid. It most commonly occurs as a crystalline heptahedra, which readily effloresces to form a white powder, the monohydrate; and is domestically well known for its everyday use as a water softener. It has a cooling alkaline taste, and can be extracted from the ashes of many plants. It is synthetically produced in large quantities from table salt in a process known as the Solvay process.

http://en.wikipedia.org/wiki/Sodium_carbonate

Sodium carbonate is a white, crystalline and hygroscopic powder with a purity of > 98 %. There are two forms of sodium carbonate available, light soda and dense soda. Impurities of sodium carbonate may include water (< 1.5 %), sodium chloride (< 0.5 %), sulphate (< 0.1 %), calcium (< 0.1 %), and magnesium (< 0.1 %) and iron (< 0.004 %). The purity and the impurity profile depend on the composition of the raw materials, the production process and the intended use of the product. For example the purity of the pharmaceutical grade must be higher than 99.5 % in prevents coalescing or to prevent formation or merging of fats. (Medicine) side Effects: Get emergency medical help if you have any of these signs of an allergic reaction: hives; difficulty breathing; swelling of your face, lips, tongue, or throat. Less serious side effects may include: Nausea or vomiting; Decreased appetite; Constipation; Dry mouth or increased thirst; or. Urinating more than

PROCEDURE

1. Take five 100ml conical flasks and label them as A,B,C,D,E.
2. Take 50ml of water in each conical flask and then add 2g of different samples of soap to each flask.
3. Warm to dissolve and get a clear solution. Arrange five test tubes on a test tube stand labeled as A,B,C,D and E.
4. Take ICC of the soap solution from each conical flask ad to the corresponding test tube.
5. Shake the test tube for 1 minute by covering its mouth by the thumb.
6. Foam will be formed in the test tube. Start the stop watch and note the time taken for the disappearance of foam.
7. Repeat the same procedure for the test tubes B, C,D and E.
8. Shaking each tube with the same force and noting the time taken for disappearance of the foam

Observation

Amount of each soap sample taken Amount of distilled water taken Volume of each soap solution taken Volume of distilled water added = 5 gm. = 50 ml. = 1 ml. = 10 ml. S. No. Soap Sample Time taken (seconds) 1. 2. 3. 4. 5

Observation Table

Sr. No	Test tube	Volume of soap solution taken	Volume of water added	Time taken for disappearing form
1	DR.WASH	1.0 ml	10 ml	9.58 hrs
2	KB ONAM	1.0 ml	10 ml	4.45 hrs
3	CHECK	1.0 ml	10 ml	8.30 hrs
4	URVASHI	1.0 ml	10 ml	7.30 hrs
5	SUPER GOLD	1.0 ml	10 ml	9.00 hrs

Factors affecting foaming capacity of soap

If calcium, iron and magnesium compounds are dissolved in the water, the foaming capability will be greatly restricted. --Temperature is also a factor. Hot water creates more foam than cold water. --Motion of solvent. If water is moving lot and changing direction it will cause a great increase in foam.

The effect of addition of sodium carbonate on their foaming Capacity

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Effect of adding of sodium carbonate on soap: adding sodium carbonate to soap can affect the activity of the soap in different manners in presence of different types of water. For example on case of hard water it will precipitate calcium carbonate and hence, activity of soap will improve. But in presence of fresh water it will reduce the interfacial tension but bubbles of soap will not be formed. In presence of saline water addition of sodium carbonate may increase pH resulting in scale formation of calcium carbonate. However, in general the foaming capacity of detergents is not affected to a very large extent by addition of sodium carbonate.

CONCLUSION

Foaming capacity of soap is maximum in distilled water as compared to that in tap water. The soap for which the time taken for the disappearance of foam is highest has maximum foaming capacity and is the best quality soap among the soaps tested.

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[3] Investigation of foaming capacity of different washing soap information in data uploaded 5 March 2014, attribution noncommercial By- NC
[4] Data collection to the Website like Google, Research gate etc.

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