EFFECT OF SODIUM SILICATE ON THE STRENGTH OF BLACK SOAP

BY

USMAN ABUBAKAR — SE/11/53626

DEPARTMENT OF BIOLOGY/CHEMISTRY
SCHOOL OF SCIENCES NIGER STATE
COLLEGE OF EDUCATION, P.M.B. 39. MINNA

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APROVAL PAGE

This project has been carefully supervised, read through and approved as having satisfied one of the necessary pre-condition for the award of Nigeria Certificate in Education (NCE) in the department of Biology/Chemistry, School of Science Niger State College of Education, Minna.

A. ATTAHIRU		29-01-2016
Project Supervisor	Sign	Date
H. Fenma (Mrs)		01-02-2016
HOD Chemistry	Sign	Date
Musah, Monday		07/02/16
Project Coordinator	Sign	Date

CHAPTER ONE

Introduction

1.1 Background of the Study

Dirt is a matter in the wrong place for Example tomato catsup on shirt. Water alone cannot remove the dirt because it is stuck by a film of grease or oil, consequently cannot dissolve in water(Jones and others,1987).(Atherton And Lawrence, 1973). When soap is however applied the greasy dirt is detached is Small piece and dispersed throughout water.Brian Lewis (2011), Defined dirt as unclean matter especially when in contact with Person's clothes, skin or possessions when they are said to become dirty.

Soap can be defined in different ways by many publications all leading to the Small thing. Davidsohn (1982) described soaps as substance which when dissolve in water give it ability to remove dirt from surface, such as human skin, textiles and other solid. Nesmeyanov (1974) defined soap as the sodium sat of fatty acids e.g. sodium stearate which is obtain by the action of sodium hydroxide on vegetable oil and animal fats. Soap is also defined as "a natural cleansing agent produced by the reaction of an alkali such as sodium hydroxide with animal fat or vegetable oil" (Ansbro, 1980). Soap in general can therefore be described as saltof long chain organic acid from fats and oils. Thecation present in the salt include, potassium ion (K^+), sodium ion (Na^+), ammonium ion (NH_4)

Soap can be produce by the direct reaction of fatty acid and alkali. Hence the processes involve neutralization reaction. This reaction is generally represented as shown below

Fatty acid+Alkali ——soap+water

Two soaps appear to be the most famous soap produced locally in Nigeria. These are black soap and soda soap. The soda is made locally by heating palm oil in a large basin until it is fried. The basin is then removed from flame and sodium hydroxide is added with continuous stirring. The soap immediately forms and begin to thicken, it is then run into empty tins where it haddens (Bajah 1983).The black soap is made locally by the collection of potash, saponification process and the finishing stage. The caustic potash used is extracted from wood ash. The wood ash is collected into a perforated barrel and water is added into the ash and resulting coloured liquid is collected to serve as the source of potash for the saponification process. The solution is concentrated by repour back to the barrel for several times and then evaporated (children Britannica 1973).

1.2 Purpose of the Study

The main purpose of this study is to find out the effect of sodium silicate on the strengthof black soap. The specific objectives are:

(a) To know the ability of black soap using sodium silicate as additive for improving the binding ability of the black soap.

(b) To find out the important of black soap as a higher cleansing agent and it's used for medical purpose.

(c) To analyze the comparison of black soap of black soap with other common toilet soap like joy and sunlight.

1.3 Research Hypothesis

HO_1 There is no significant differences between the strength of black soap and the amount used.

HO_2 There is no correlation between the color or odor and attractive properties.

1.4 Significance of the Study

It is hoped that the finding in this study will help to:

(a) Know the important of black soap as a cleansing agent

(b) It will also help to know the ability and strength of black soap in removing dirty

(c) It will help in knowing the important of additive for improving the binding ability of black soap

(d) It help in awareness to people that black soap has higher cleansing, and it has medical purpose.

1.5 Scope and Limitation

This research is restricted to the strength of sodium silicatesas an additive to black soap, the color and odor of black soap and it cleansing strength compare to other soap or detergent use as a cleansing agent.

CHAPTER TWO

Literature Review

2.1 Classification of Soap

The bases for the classification of soaps include composition, solubility and application. They are classified as soluble and insoluble soaps. Soluble soap is made from caustic soda or caustic potash used for all cleansing purposes. They contain either sodium or potassium metal. Insoluble soaps on the other hand are salts of calcium and magnesium. Other metals present in insoluble salts are aluminum, cobalt, zinc, lead, barium, lithium and copper. They are not soluble in water but they can be dissolved in organic liquids and are used to form Water in oil emulsions and for other applications (New standard, 1984).

The new standard Encyclopedia (1984) further classified soaps as light and heavy duty and explained that light duty products are primarily for dishes and delicate fabrics that are washed by hand i.e. fine fibrics. This class of soap is not effective on heavily soiled clothes. Heavy duty soap on the other hand includes all products ordinarily used for house hold washing.

2.2 General Uses of Soap

The important of soap as a cleansing agent was apparently not recognized until the second century. Previously soap has been used as medicine so that the most important use of soap at that time was to serve for medical purposes. The medical use is been recognized. For example, a solution containing 0.05moles of soap per 50cm3 of water kills germs and help to stop the spread of diseases (farkas, 1980). However writings attributed to the 8^{th} century of Hayyan (Geber) Mentioned soap as a cleansing agent. Thus today the most important use of soap is for cleaning purposes (Davidsohn, 1982) soaps also play a vital role in industries. They are used as cleaners, lubricants, softeners and polishers in the manufacture of many different kinds of products. They are used in preparing emulsions such as cosmetics. Pharmaceutical creams, lotions, Ointments, self- polishing waxes, sprays for insecticides, fungicides and disinfectants. Finally soaps are used to water-proof textiles, concrete and inhibit the corrosion of metals (Davidsoh, 1982).

2.3 Cleansing Action of Soap

Water alone does not easily wet substance and it does not mix with oil and grease, thus will not easily remove oily or greasy dirt (Henderson, 1976). This is attributed to the large surface tension of water. The cleansing action of soap depends on the nature of the substrate, the dirt to be removed and the cleaning conditions, such as detergent concentration, temperature and degree of agitation (Tedder and others, 1975). A and successful detergent system detaches dirt from the surface to be cleaned and disperses the dirt in the wash-liquor i+n such a way that the cleaned substrate can be separated from the wash liquor Without the dirt being redeposit on it (Tedder and others, 1975). Soap when dissolved in water dissociates into ions with polar and non-polar ends. Refelson and others, (1980) gave the dissociation of soap in water as shown. RCOOM RCOO$^-$ + M$^+$

Where R is a long chain carbon atoms insoluble in water (hydrophobic), COO$^-$ is the soluble group (hydrophilic and M$^+$ is the metallic cation. Mast (1982) and peet (1982) stated that soap cleans through wettings, emulsification and solubilization. The molecules of soap in water gather at the surface with their Hydrophilic ends dissolved in water and their hydrophobic ends striking up in the air (farkas, 1983). As the concentration of soap increases the molecules inside begin to arrange themselves in spherical aggregates with hydrophobic tails inside and micelles and the concentration at which they begin to be formed is called the critical micelle concentration (CMC). (Tedder and others, 1975). The formation of micelles lower the surface tension of water in the region where the micelles are made and the micelles are formed throughout the water body which enables the water to wet the solid surfaces effectively (Steedman and others, 1980). Tedder and others (1975); Peet (1982); Mast (1982) and farkas (1980) explained the emulsification and solubilization actions as follows. The hydrophilic end of the soap is attracted by water while the hydrophobic end penetrate the oily dirt at the same time the hydrophilic end exert pull on the hydrophobic end which necessitate breaking of the dirt into minute droplets, surrounded by a layer of soap molecules thus keeping them dispersed in the wash solution. Mechanical agitation of rubbing the oily dirt with hands helps process. Oily dirt's during washing are solubilized and the solubilization is due to the ability of soaps to form micelles which provide a non-polar environment in the aqueous medium in which oily materials can dissolve

2.4 Composition of Soap

The competition for cleansing ability from the synthetic detergents and the effort of manufactures to supersedes one another lead to the present day formulations of various types of soaps available in the market. They arecomposed of additives apart from the basic surfactants which reduce the surfacetension of water/washing solution. The surfactants in soaps are metallic salts of fatty acids which are the principal agents that do the actual cleaning by reducing the surface tension of water and help to lift dirt from the substances being washed (Farkas, 1983). Additives are substances which give soap specific characteristic (Davidsoh, 1982). Additives do not prevent the cleansing action of the soap, do not interact adversely with the material being washed and always render the soap biodegradable . Additives include builders as chelating agents, bleaches sudsing modifiers, fluorescent whitening agents (FWA), enzymes, perfumes and colorants. Builders as chelating agents precipitate polyvalent metal ions present in the cleaning solution particularly calcium and magnesium ions in hard water. They are added to form molecular complex that locks up the polyvalent metal ion so that it no longer exhibit ionic properties, this becoming inactive and the water is effectively softened. Builders also provide alkalinity in the washing solution, prevent redeposit ion of soil removed on to the surface and enhance destruction and removal of micro-organisms. Example of builders include sodium/potassium silicate and sodium carbonate which keep dirt removed from in suspension and increase the binding ability of the soap, sodium sulphate improves the detergency of the surfactants and sodium salt of Ethylendiammine Tetra-acetic acid (EDTA) form molecular complex that chelates the calcium or Magnesium ion, so that it no longer exhibit ionic properties. .

(Davidsohn, 1982).Bleaches/whiteners are used to removecolor and increase the whitening of textile after washing. Textile is commercially bleached with oxidizing agents such as sodiumhypohlorite. Other bleaching agents are per oxygen such as hydrogen peroxide and sodiumperborate.). Sudsing modifiers present an aesthetic appeal though it may not add essentially to the function of the product. Sudsing can be increased by adding small quantities of function of the product Sudsing can be increased by adding small quantities of anionic surfactants, such as mono and diethylamide of C_{10}-C_{16} fatty acids (Van No strand's scientific encyclopedia, 1983). Fluorescent whitening agents FWA are dyestuffs absorbed by textile fibres from the solution but not subsequently removed on rinsing. The convert ultraviolet light into subsequently light into the blue side of the spectrum, causing the fibre to reflect part of the absorbed energy as visible light, thus blue violating will complement any yellowishness present on the fire to make it brighter (Davidsohn, 1982). Enzymes act as catalyst in breaking down biological stains, such as grass, blood, milk, egg, starch and foodstains. The protein sources are broken by proteolytic enzyme, the carbohydrate sources are broken byAmylolytic enzyme and fat sources are broken by lipolytic enzyme (Van Nostrand's Scientific Encyclopedia, 1983; Osipow and Snell, 1980). Perfumes and colorants (minor additives); perfumes are added to provide a pleasant and distinctive odor where colorants are dye which give the soap a characteristiccolor(mast, 1982; The New Standard Encyclopedia, 1984).

The illustrated science and invention Encyclopedia (1977) stated the toilet soaps contain higher quality fats with low water content of about 10%. However Jones and others (1987) stated that "Toilet soaps contain a little filler, minimum amount of free base, glycerol which is released in the saponification process, perfumes, dyes and medicinal agents added prior to casting the soap into solid form". The use of some additives gives the soap a special purpose. Antiseptics are added to prevent the growth of micro-organisms that cause body odors and such formulation give Deodorant soap. When antibacterial substances are used to Prevent/reduce infection Medicated soap is formed. The presences of extra oil/fat such as cold creams or linolins smoothers the skin and give super fatted soap. A high content of glycerol helps the skin to retain its natural oils; such soap is called transparent soap. (New standard Encyclopedia, 1984). The laundry soaps are made from neat soap which contains 28% of water and perfumes. The shaving soaps are made from fats with a minimum unsaturated acids, tallow and coconut oil-saponified with caustic potash or a potash –soda mixture to promote easy lathering. (The illustrated Science and Invention Encyclopedia, 1977). Jones and others (1987) state that hard amount of potassium salts of a relatively long chain unsaturated fatty acid. Fagbule and Sosanwo (1983) reported the content of common soaps manufactured in Nigeria. These include lux, sunlight and blacksoap. They are found to contain fatty acids, glycerol, chloride and free alkali.

2.5 Raw Materials for Soap Production

The raw materials for soap manufacture are animal fats such as tallow from beef or mutton and lard from pork or vegetable oils such as coconut oil, palm kernel oil and alkali . The most important fats/oils that yield a viable soap and used as raw materials for soap manufacturing contain 12-18 carbon atoms. Fats and oils containing carbon atoms less than 12 yield soap that irritate skin, create unpleasant odor and refuse to emulsify in water and the ones containing carbon atom greater than 18 yield a soap that is too insoluble in water to be an effective detergent(Davidsohn (1982) grouped fatty raw materials for soap production into four on the basis of effective lathering of the soap they yield:-

I. Hard fats yielding slow lathering soaps, which include tallow garbage greases, hydrogenated marine oils, vegetable oils and palm oil. They yield soaps that produce little lather in cold water, more in warm water; are mild on the skin and cleanse wall. Tallow is the most important member.

II. Hard fats yielding quick-lathering soaps, which include coconut oil, palm kernel oil and babassu oil. These fats are not very sensitive to electrolytes such as salt; thus are suitable for the manufacture of marine soap which lathers in sea water. This is second most important group of fat with coconut oil mostly used.

III. Oils yielding soaps of soft consistency such as olive oil, soybean oil and groundnut oil. These oils readily undergo changes in air, light or during storage; soap made from them may become rancid and discolored. Linseed and whale oils belong to the group.

IV. Rosin form a group of its own, it is used in yellow laundry soap, less expensive toilet soap and special soaps in various industries. Chevreul, (1823) discovered the constituents of animal fats/vegetable oils to be fatty acids and glycerol.

Fats and oil are therefore Easters of glycerol and fatty acids (Children Brittanic, 1975). Garret (1982) described fatty acids as long-chain hydrocarbons with an acid group-COOH.For example capric acid (Decanoicacid), lauric acid (Dedocanoic acid)Myristic acid (Tetradocanioc acid) and Oelic acids [Octadec-9-enoic acid]. The structure of acid in fats indicates that they are saturated while those in oils are unsaturated with additional group such as -OH, -NH_2e.t.c. (Singh and Singh, 1961).Holum (1961) and Betteltheim and march(1985) gave the general structural properties of acids found in fats and oils for soap making: they are usually monocarboxylic acids R-COOH, the R-group is usually without branche chain, they range in size from about ten to twenty atoms and the hydrocarbon longchain is even number because plants and animals body builds these acids entirely from acetic acid unit and therefore puts the carbon in two at a time and finally they have high melting point which increase with increase in number of carbon atoms and decrease with increase in number of carbon atoms and decrease with increase innumber double bonds. Example (Example of fats and oils made from fatty acids includeTrilaurate (Ester of lauric acid with glyceol), Trimyristate (Ester of myristic acid with glycerol) and Oleodimyristate (Ester of Myristic and oleic acids with glycerol).

Fernando Akujobi(1987) reported the qualities of fats and oils found in some towns in sokoto state and their result showed high potentialities as raw materials for soap production.

Alkali is used for soap production and the word comes from Arabic Meaning ashes. Ashes of wood and seashore plants were used as alkaline source in the past (Children's Britannica, 1975). invented salt thus did away with the difficult job of obtaining alkali from ashes (Illustrated science and invention Encyclopedia, 1977). Alkalis four soap making also include caustic soda (sodium hydroxide), caustic potash (potassium hydroxide) and Ammonium hydroxide. (Garrett, 1982, Davidsohn, 1982).Onuchukwu (1991) discovered the use of solution of ashes of Elaeisisguineesis as a source of alkali for alkali for soap production and recommended it for uses in Nigeria.

2.6 Soap Production

Hydrolysis of far by Alkali produces organic salts and glycerol. This mode of fat hydrolysis is referred to as saponification or soap making (sigh and Singh, 1961). Mast (1982) gave the general reaction during saponification Fat/oil + Alkali soap + Glycerol. Example of this reaction is that of fat Tripalmitate, an ester of palmtic acid and glycerol with sodium hydroxide to yield sodium palmitate (soap) and glycerol. Alternatively soap can be obtained by direct reaction of fatty acids and alkali. Hence the process involves neutralization reaction (Singh and Singh, 1961). This reaction is generally represented as shown below: Fatty acid + Alkali soap + water. It should be noted that in this reaction, the resulting product is soap and water instead of soap and glycerol. (Davidsohn, 1982).Three methods of soap production are known, in each case however, the major constituents of the resulting soap are still the same, Neckers and Doyle (1977) Pointed out that "The essential reaction for preparing soap has not change Throughout man's history". Moreover in each case the properties of the resulting Soap will depend on the mixture of fats or fatty acids used, the kind of alkali and The post saponification processing the soap undergoes (Illustrated science andInvention Encyclopedia 1977). The three methods include the laboratory Small-Scale production, the local soap manufacturing method and the industrial soap manufacturing method.

The laboratory method involves the manufacture of soap in small scale: Add 2cm^3 Ofeastor oil to 10cm^3 of 5M sodium hydroxide solution in a beaker and boil for ten minutes, stirring continuously with a glass rod. Add 10cm^3 of an aqueoussaturated solution of common salt to decrease the solubility of the soap and continue the boiling for a further three minutes. Cool the mixture and filter the soap that forms (Gerrish and Mansfield, 1971).

Two soaps appear to be the most famous soaps produced locally in Nigeria. These are blacksoap and soda soap. The soda is made locally by heating palm oil in a large basin until it is fried. The basin is then removed from flame and sodium hydroxide is added with continuous stirring. The soap immediately forms and begins to thicken. It is then run into empty tin where it hidden (Gerrish and Mansfield, 1971).ThisSoap produced is mostly use for laundry purpose.

Fagbule and sosanwo (1983) described the three operations involved in the makingof black soap. The caustic potash collection, saponification process and the finishing stage. The caustic potash used is extracted from wood ash. The wood ashIs collected into a perforated barrel and wateris added into the ash and resulting coloured liquid is collected to serve as the source of potash for the saponification process. The solution is concentrated by pouring back to the barrel for several times and then evaporated (Children's Britannica 1973). The saponification process involves boiling and stirring a relative amount of caustic potash together with fats or oil from either palm oil, palm kernel, coconut etc. at a very high temperature for about nine hours, a stage will be reached when the mixture foams This indicates that saponification has occurred. Then Ogiyam, plantain or cassava flour is added as additives, the boiling and stirring is continued and the soap is then collected at the top. The soap is rolled into balls with palms of the hand.

Some dry woods are first place in the palms before the rolling to give a nice finished surface. The industrial soap production was stimulated by three important discoveries, simulation of the reaction that takes place in the present day boiling process of soap making by Scheele (1783), the Lablane method of preparing caustic alkali from common salt (1791) and chevreuls (1823) discovery of fat decomposition before saponification is effected; Illustrated science and invention Enclopedia,1977).The industrial soap manufacturing process include the boiling process, the cold process and the semi boiled (Singh and Singh, 1961). The boiling process alnvolves boiling and stirring large quantity of a mixture of Animal fats/vegetable oils and alkali. The objectives of the process are to produce soap in purified form, free from glycerol and all other impurities (Davidson, 19782). The process gives soap in batches over a period of four to eleven days, because of the duration it is called batch or kettle process. However, when continuous flow production of soap for few hours is desired, the process is referred to as continuous process. The kettle or Batch process starts by process starts by pumping heated fats/oils intoHuge kettle where steam coils of the kettles keep the fat hot. The alkaline solution is added gradually and the mixture is gently boiled for several hours for the saponification reaction to take place. The mass gradually thickens as the caustic soda reacts with the fat to produce both soap and glycerol. The kettle contains a thick paste of soap, glycerol, water and some unreacted alkali. Common salt is added to the viscos mass which then separates into two layers. The soap which is Insoluble in a salt solution rises he top as a curd and below the curd is an aqueous salt solution with glycerol dissolved in it called spent lye. The spent lye is drawn off from the bottom of the kettle to a recovery unit, where it is treated and the glycer oils obtained as a useful by product while the salt is recovered for use again. The soap left behind in the kettle is impure because it contains glycerol, unsaponified fat, dirt and coloring matter in the original oils. Strong caustic solution is added and then boiled to remove the last of the free fat. Salt is added again to precipitate out the soap and draw off the spent lye. Water is added to thesoap in the kettle, the mixture is again boiled , the soap is salted out and glycerol is drawn off . The washing removes a lot of the undesirable coloring matter and for further bleaching sodium hydrogen sulphite or sodium chlorate are added before the final wash. The final washes involve pitching which is boiling the soap with water until a concentration is attained that causes the kettle contents to separate into two layers. The upper layer contains the "neat soap" sometimes called "kettlesoap" of almost constant composition for a given fat (about 70% soap, 30$% water). The lower layer called nigre varies in soap content from 15% to 40% because coloring matter, dirt, alkali and metal soaps are soluble in nigre, the impurities are dense which tend to settle. The neat soap is pumped away for further processing and the nigre assists the new saponification. (Davidsohn, 1982; Steward and Tows, 1984). The continuous soap production had replaced the old boiling process because it produces high quality soap at least cost, permits a wider variation in the fats/oils used, requires less manpower, permits better control and easy recovery of glycerol, above all much soap in a few hours as against days by the Batch process (Farkas, 1982; Davidsohn, 1982)

The continuous process is carried out in three steps: hydrolysis of the fat to fatty acids and glycerol, distillation of the fatty acids and neutralization of the distilled fatty acids.

Hydrolysis of the fat is done by continuous pumping of water under high pressure and temperature in the presence of a catalyst in to top of a tower while the hot fat is continuously pumped into the bottom of the tower. The fat splits into fatty acids and glycerol, the fatty acids rise to the top and the water containing glycerol falls to bottom. Both are simultaneously removed continuously. The fatty acids are the pumped into a vacuum still for purification and the pure fatty acids are neutralized with an alkali to effect saponification and "neat soap" is produced (Farkas, 1982; Davidsohn, 1982).

The cold process involves mixing the fats/oils with alkali and agitating the mixture at a temperature not much over 38°c to obtain soap. The heat that is involved in the saponification process is the heat of reaction (Illustrated Science and Invention Encyclopedia, 1977). The procedure in the cold process is to heat the alkali to a temperature of about 50°c. A high percentage of coconut or palm kernel oil are mixed together with the alkaline solution in a cruncher, slightly less alkali is used to leave a small amount of unsaponified fat/oil as a super fatting agent in the finished soap. The soap is mixed and agitated through crutching until it begins to thicken; it is then poured in frames and left there for 24 hours to complete the saponification and solidify. Glycerol is usually not removed (Davidsohn, 1982; Singh and Singh, 1961).

The semi-boiled process involves a process in which the reaction between fats/oils with alkali is started and promotes by external heating but continued by the heat of reaction. (Illustrated Science and Invention Encyclopedia, 1977).The melted fat is Introduce into the kettle and alkaline solution is added while the mixture is stirred and heated but not to boil, the temperature is usually raised to 70^{0}c. The mixture is saponified in the kettle and is poured from there into frames, where it is solified.

The half boiled soap contains all the glycerol originally present in the oil and the process therefore is very suitable for toilet soap. The cold and semi-boiled processes are technically simple and require very little investment for machinery and are ideal for small factories (Singh and Singh, 1982).

CHAPTERTHREE

Materials and Method

3.0 Introduction

The methodology involved collection of soap materials, extraction of alkaline solution, and determination of alkaline concentration by titration, preparation of additive and soap production.

3.1 Materials and Apparatus

1. Caustic alkali from wood ashes
2. Refined palm kernel oil.
3. Common salt B.D.H chemicals Ltd Poole England
4. Distilled water
5. Sodium silicate B.D.H chemicals Ltd Poole England
6. Hydrochloric acid B.D.H chemicals Ltd Poole England
7. Methyl orange indicator B.D.H chemicals Ltd Poole England
8. Erlenmeyer flasks (Conical flasks) Pyrex, James. A. Jobling and Co.Ltd Sunderland England.
9. $100cm^{3,}$ $300cm^3$ and $500cm^3$ Beakers (Pyrex). Corning Laboratory Ltd Stafford Shire England.
10. $250cm^3$ volumetric flask (Pyrex). Shanghai Machinery Lmp. and Exp. Corporation China
11. 12.5cm Whatman filter paper. WhatmanLtd .maid stone England

12. $50cm^3$ and $10cm^3$ measure cylinder-Volac England.
13. Ohausettle GT 400 top loading weighing balance (Digital) Scale Corporation. Florham park U.S.A. $20cm^3$ pipette (Technico).
14. Pipette filler. Labor Alliance Germany.
15. Stainless steel spatula.
16. Bunsen burner.
17. Wash Bottle.
18. Glass rod.
19. Retort stand.
20. Glass Funnel (Pyrex).
21. Wire gauze with ceramic top.
22. Tripod stand.

3.2 Collection of Soap Materials

1. Refined plan kernel oil was bought from market.
2. A dry wood was obtained, burnt on clean zinc sheet and the ashes were collected.

3.3 Extraction of Alkaline Solution

The ashes collected were poured into a perfected tin, water was added and the resulting drains from the press of the tin were collected and poured back into the tin several times to obtain a maximum content of alkaline solution . The extract collected was boiled in 500cm^3 beaker to concentrate the solution.

3.4 Preparation of Solutions for Titration

a. Preparation of standard hydrochloric acid solution. 0.3029 molar of the acid was prepared by diluting 6.5cm^3 of the concentration hydrochloric acid with Percentage purity of 36%. Specific density of 1.18 and molar mass of 36.5 in a 250cm^3 volumetric flask and made up to the mark with distilled water. The mixture was shock very well for proper dilution.

b. Dilution of the concentrated alkaline solution extract.5cm^3 of the concentrated alkaline solution extract was pipetted and transferred into a 250cm^3 volumetric flask and made up to the mark with distilled water. The Mixture was well shaken to effect a proper dilution.

3.5 Determination of Alkaline Concentration by Titration Using Methyl Orange as Indicator

The Vogel's method (1961) for determination of total alkaline concentration in a mixture by titration was used to determine the concentration of the solution. The burette was filled with the standard hydrochloric acid solution: 20cm^{3}of the alkali was pipette and transferred into a an Erlenmeyer flask and two drops of methyl orange indicator were added .The acid was then titrated against the alkaline solution and the end point volume taken at a stage the mixture in the Erlenmeyer flask turned orange. The process was repeated three more times and the concentration of the dilute alkaline solution was calculated; hence the concentration of the Original alkaline extracts which were found to be 0.1777mol/dm^3 and 8.88mol/dm^3 respectively.

3.6 Preparation of Additive Solution

0.6g of sodiumtrioxosilicate (IV) was dissolved in 20cm^3 of water the solution was heated and left to ferment in a Erlenmeyer flask for 48 hours.

3.7 Experimental Procedure for Soap Production

The boiling method was used for the saponification process; this gave the assurance of complete saponification and other related advantages. Three different productions A, B and C were made as follows. 15cm^3 of the concentrated alkaline extract was measured into 100cm^{3}beaker; 3cm^3 of palm kernel oil was added to the alkaline solution and boiled. The mixture was continuously stirred until if foams indicating that saponification have taken place. Two spatulas of common salt were added and the mixture was further heated for three minutes and then filtered. This was labeled A.The second production (B) was carried out by mixing 30cm^3 of the oil with 15cm^3 of the alkali in 100cm^3 beaker and boiled. The mixture was stirred continuously until it foams. Two spatulas for three more minutes and then filtered. The third production (c) involved measuring 30cm^3 of the oil into 100cm^3 beaker, 15cm^3 of the alkali was added and boiled. The mixture was continuously stirred until the saponification has taken a place.2.1cm^3 of sodiumtrioxosilicate (IV) solution, two spatulas of common salt were added, and heating continuous for other three minutes and the mixture was filtered to obtain the final product for keep.

CHAPTERFOUR

Result and Discussion

4.1 Results

The first production gave dark-brown soap with foaming ability, cleansing ability and odor almost equal to that of black soap but very soft to touch. The second production gave a dark-brown soap with higher foaming and cleansing ability. The third production also gave a dark-brown soap with improved foaming ability, cleansing ability and strength with odor as that of the black soap.

4.2 Discussion

The first product was too soft and difficult to handle. This can be attributed to the absence of any additive. It was very harsh to the skin as a result of excess unreacted alkali. The increase in the foaming and cleansing ability of the second product might be attributed to the complete neutralization of acids in oils by alkali.

The remains of unsaponofied oils in turn make the soap milder to the skin. Thepresence of silicate in the third product improved its strength and makes it fairly attractive due to increase in strength.

CHAPTER FIVE

Recommendation and Conclusion

5.1 Recommendation

Based on the finding of this work, the following recommendations were made to produce black soap with improved properties.

- Silicate improved the strength of the black soap using small amount, thus it is economical.
- When boiling point is employed and glycerol is removed, the soap is harsh to the skin, therefore it is recommended to use oil/fat to alkali ratio of 2;1 respectively for a very concentrated solution of alkali so as to yield a super fatted soap that ismilder to the skin.
- Color and odor also contribute to its attractive properties, therefore perfect attraction can result by improving to the color and odor of black soap using decolourizers, colorants and perfume for further works.
- Various strengthening agents other than silicate can be tried.

5.2 Conclusion

Black soap has received a greater negligence from people because of its odour, colour and strength but cheaper than the commercial soap. If colour, odour and strength are improved people will be greatly attracted and will benefit a lot from it.

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