

**Analysis of Some Brands of Detergent Sold in Sokoto****Bello, <sup>1</sup>S. S. Yusuf, <sup>1</sup>A.J. Mshellia, <sup>2</sup>H. E. Lawwali<sup>3</sup> H.**<sup>1</sup>Department of Pharmaceutical and Medicinal Chemistry, Usmanu Danfodiyo University, Sokoto.<sup>2</sup>Department of Pharmacognosy and Drug Development, Usmanu Danfodiyo, University, Sokoto.<sup>3</sup>Department of Pure and Applied Chemistry, Usmanu Danfodiyo University, Sokoto.\*Corresponding Author: [\\*ssbello66@gmail.com](mailto:ssbello66@gmail.com) Tel: +2348036993111

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**ABSTRACT**

*Detergent is commonly available as powders or concentrated solutions. Detergent work because they are amphiphilic- partly hydrophilic (polar) and partly hydrophobic (non- polar). Qualitative determination of Surfactant, Sulphur, Phosphorus and Nitrogen (as cyanide) were carried out with Quantitative analysis for Sulphate, Foamability and Total alkalinity. All the samples were found to be anionic detergents, Sulphur, Phosphorus were present in all the samples but Nitrogen was not detected. The percentage alkalinity for samples A- E were; 32.40, 72.08, 37.52, 46.60 and 55.50 respectively as carbonate with 4.8, 5.6, 6.9, 4.4 and 1.8 % as Hydroxide. Similarly, heights (cm) of foam formed for samples A-E were 440, 430, 410, 450 and 450. The percentage concentrations of Sulphate were 97.5, 27.5, 43.5, 42.0 and 52.0. Therefore, Sample B is good for hard-water washing, C is good for fabrics, D is good for stain removal and A,E samples are good for utensils and washing machine.*

**Keywords:** Detergent, Washing, Surfactant, Analysis, Brands.**1.0 INTRODUCTION**

Detergent and soap are used for cleaning because ordinary water can't remove oily dirt. Soap cleans by acting as an emulsifier, therefore, it allow oil and water to mix, so that oily diet can be removed during rising. Detergent, were developed in response to the shortage of the animal and vegetable fat used to make soap during world war I and world war II. Detergent is primarily surfactants which could be produced easily from petrochemicals. Surfactant lower the surface tension of water, essentially making it 'wetter' so that it is less likely to tick to

itself and more likely to interact with oil and grease (Isah and Garba, 2005)

In common usage "detergent" refers to alkyl benzene sulphonates, a family of a compound that is similar to soap but is less affected by hard water, (Eduard, et, al 2002). Detergent helps to remove dirt in water by penetrating and breaking up films that bind dirt particles and wetting agent making them to float off, (Chatwal, 1986).

The term detergent by itself refers specifically to laundry detergent or dish detergent as opposed to hand soap or other types of cleaning agents. Detergent is

commonly available as powders or concentrated solutions. Surfactant may also acts as detergent therefore, surfactants are compound that lower the surface tension of a liquid and solid, which is blend as surface active agent, (Rosen, 2010).

Detergents are made by the sulphonation of alkyl benzenes with oleum (fuming sulphuric acid) to give alkyl benzene sulphonic acid which is then neutralized with caustic soda to sodium salt, (Ivan, 1980).

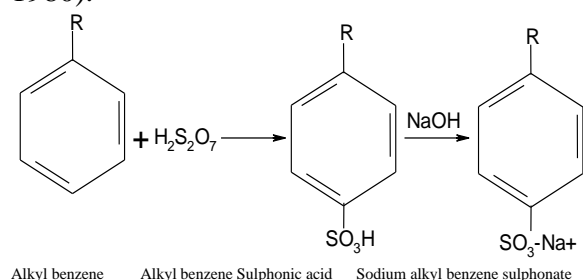


Fig.1; Sulphonation reaction

Detergent is classified in to two broad groupings, depending on the electrical charge of the surfactant.

**Anionic Detergents;** Typical anionic detergents are alkyl benzene sulphonates. The alkyl benzene portion of these anions is lipophilic and the sulphonates is hydrophilic. Two varieties have been popularized, those with branched alkyl groups and those with linear alkyl groups, (Eduard, *et, al*, 2002). An estimated 6 billion kilograms of anionic detergents are produced annually for domestic markets.

**Cationic Detergents;** Cationic detergents are similar to the anionic ones, with a hydrophilic component, but instead of the anionic sulfonate group, the cationic surfactants have quaternary ammonium as the polar end. The ammonium center is positively charged, (Eduard, *et-al* 2002).

## 2.0 MATERIALS AND METHOD

**2.1 Materials;** Volumetric flask, measuring cylinder, burette, pipette, conical flask, beaker, magnetic stirrer, heating mantle, weighing machine, dry oven, test tube, retort stand, filter paper, UV spectrophotometer, Detergent samples coded A, B, C, D, E and Analytical Grade chemicals.

### 2.2 Methods;

**2.2.1 Determination of Surfactant;** 1g of each sample was dissolved in a beaker of 50 mL of distilled water and heated on a heating mantle for 10 minutes. After cooling, 5 mL of acid methylene blue solution was added and 10 mL of chloroform also added to the solution.

**2.2.2 Qualitative Analysis;** 0.1g of each sample was thoroughly mixed with 1g of Middleton mixture in a test tube and a little distilled water was added into the solution and then heated strongly for 2 minutes in a hot Bunsen flame. The solution was poured into 20 mL distilled water in a beaker. The mixture was boiled so as to dissolve sodium salt formed. The solution was then filtered and the filtrate was divided into three portions (Longman, 1975) for Sulphur, Phosphorus and Nitrogen analysis.

**2.2.3 Test for Sulphur;** To the first portion of the filtrate above, 10mL of concentrated HCl was added and tested immediately with lead acetated paper.

**2.2.4 Test for Phosphorus;** To the 2 mL of the filtrate, 4 mL of concentrated nitric acid was added and boiled carefully to oxidize any phosphorus compound present to phosphate ion. The solution was allowed to cool and 5 mL of 0.02 M ammonium

molybdate solution was also added to the solution.

### 2.2.5 Test for Nitrogen (as cyanide ion);

To the 2 mL of the filtrate solution, little solid iron III sulphate and 4 drops of 2M NaOH were added then the solution was boiled for 1 minute, then 3 mL of FeCl<sub>3</sub> solution was added. A little concentrated HCl acid was added to dissolve any hydroxide present in the solution followed by filtration.

### 2.2.6 Quantitative Analysis; SULPHATE ION (SO<sub>4</sub><sup>2-</sup>)

0.5g of each sample was weighed and dissolved in 50 mL of distilled water in a beaker and placed on a heating mantle to dissolve. After cooling, the solution was then transferred to 250 mL volumetric flask and made to mark. 1 mL of the solution was pipetted out and 5 mL of conditioning reagent was mixed and magnetic stirrer was dropped into the solution. The solution was diluted to 50 mL of distilled water. 0.5g of Barium chloride was added and stirred for 1 minute. The absorbance of the solution was taken using UV Spectrophotometer at a wavelength of 505 nm. A blank containing 25 mL distilled water and other reagent were mixed for the zero setting of the instrument.

### 2.2.7 Determination of Total Alkalinity;

0.5g of each sample was dissolved in a beaker of 50 mL of distilled water, then transferred to 250 mL volumetric flask and made to mark. 25 mL of each sample was pipetted into conical flask and 3 drops of methyl orange were added and titrated against 0.1 M hydrochloric acid. Another 25 mL portion of the sample was warmed to about 100°C and barium chloride solution was added until no further precipitated

produced. After cooling, 2 drops of phenolphthalein were added and the mixture was titrated with standard 0.1 M hydrochloric acid, the end point was obtained when the colour changed from pink to colourless.

### 2.2.8 Foamability Test on Detergent

2.0g of each sample was dissolved into 500 mL measuring cylinder containing 100 mL of distilled water. The mixture was shaken vigorously so as to generate foams. After shaken for 2 minutes, the cylinder was allowed to stand for about 10 minutes. The height of the foam in the solution was measured and recorded.

## 3.0 RESULTS AND DISCUSSION

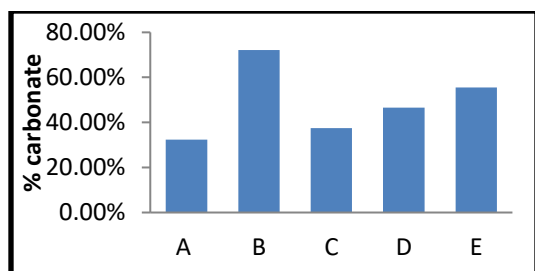
**3.1 Surfactant Test** showed that at the aqueous phase, the solution is colourless, while at the chloroform phase, the solution is blue which indicate that it is anionic Surfactant

**3.2 Phosphorus as Phosphate ion** was identified as a result of yellow precipitate formation

**3.3 Nitrogen (as cyanide)** was absent in all the samples because a red color was observed on the filter paper.

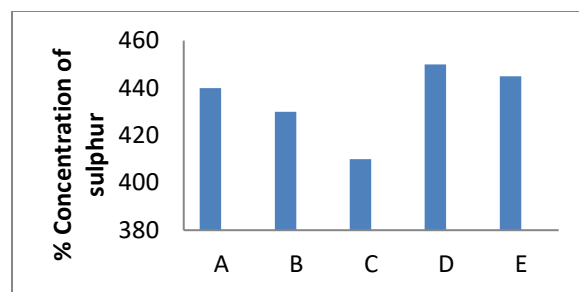
**3.4 Sulphur:** A dark brown color was observed on the filter paper which confirmed the presence of hydrogen sulphide, H<sub>2</sub>S. The sulphide confirmation indicated the presence of Sulphur in the samples.

**3.5 Alkalinity:** The results two methods used are shown in the following Figures:  
1<sup>st</sup> method (CO<sub>3</sub><sup>2-</sup>)



Brands

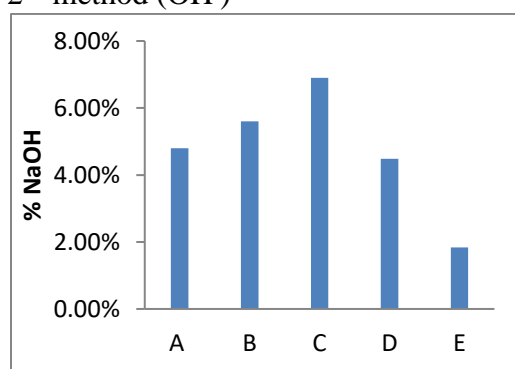
Figure 2. Percentage content of Carbonate in the samples



Brands

Figure 5. Sulphate content of each sample

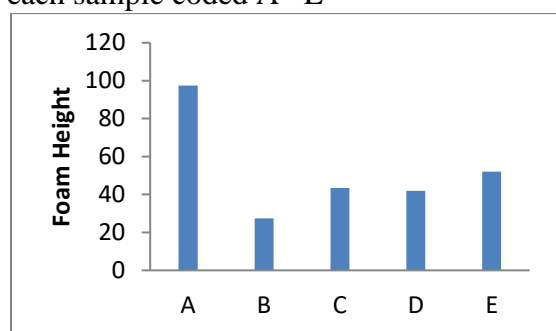
2<sup>nd</sup> method (OH<sup>-</sup>)



Brands

Figure 3. Percentage content of Hydroxide in the Samples

**Foamability:** Results of foam formed by each sample coded A –E



Brands

Figure 4. Height of foam for the Samples

### Quantitative Analysis of Sulphate ion

From the equation  $SO_4^{2-} + BaCl_2 \rightarrow BaSO_4 + 2Cl^-$ , the Concentration of sulphate ions for all the samples is shown below:

### 3.1 DISCUSSION

From the results obtained, sample B has the highest percentage of carbonate, so it's easy to work with even well water or any other hard water for washing. This is because Carbonates tend to improve detergency by inhibiting the tendency of precipitated Carbonates from being deposited on the washed fabrics (Smulders *et. al.*2005). Sample C has the highest percentage of hydroxide content, which helps in increasing the alkalinity of the product, and this is why it performed best on fabrics since alkalinity is a measure of the ability of a solution to neutralize acids to the equivalence point of carbonate or bicarbonate. According to the Indian Standard, the active alkalinity of detergent powder of Grade 1, 2 and 3 should be 15 per cent, 20 per cent and 30 percent, respectively (Consumer, 2015).

Sodium sulphate is added to detergent to act as solublizing agent. Sample A and E have the highest concentration of sulphate ions. Similarly, Sample D has the highest height of produced foam in water from the formability test, therefore, performed best in stain rest to removal. The relationship between foaming power has always been of interest to consumers (Kogawa, *et al.*,2017). Although Detergent Technologists agreed that there was no direct link between foam heights and washing power on ordinary fabrics system, foam plays an important role by holding up particles of soil removed from

being deposited again back to washed fabrics so that it can be washed off by rising (Kogawa, *et al.*, 2017). Similarly, the efficiency of washing power of detergent is asses through the amount of foam it can form. Therefore, the presence of persistence foam indicates good detergent (Bajah, *et al.*, 1995)

#### 4.0 CONCLUSION

The results obtained showed that different detergents studied have different content of the same composition. This could be due different action of these brands. Therefore, consumers can select a brand for a particular purpose to be used.

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