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## **Hazardous Nature of Native Chalk (Calabash chalk)**

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### **Abstract**

**Native Chalk found as white** pasty or buff lime stone naturally very close to the stream or at the bank of the river and widely eaten by pregnant women as well as traditional worshipper in making medicine was investigated in this research work .The chalk samples was collected from Atani in Anambra state, Benin in Edo state, Umutu in Delta state and Port-Harcourt in Rivers state, Nigeria West Africa.

Quantitatively, mineral elements such as Iron Calcium, Aluminum, Silicon, Bicarbonate and Sulphate are found to be present in native (Calabash Chalk). Gravimetrically, the samples are found to contain the metal such as lead above the permissive level of the World Health Organization standard for water with lead ranging from 0.01mg/ l to 0.040mg/l , while iron is 38mg/l to 76mg/l , calcium and 27mg/l to63.3mg/l minimum and maximum desirable level respectively. The study reveals that the native chalk which occurs naturally in different environment has concentration of lead that is known for its hazardous effect to life is present above desirable level. This implies that Native chalk could be hazardous if constantly eaten.

**Keywords:** Native Chalk; Calabash Chalk; quantitative; Gravimetric.

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## 1. Introduction

Native chalk, a geographical material which is consumed largely in West Africa is highly patronized by pregnant women [1, 2].

The practice of heating earth is associated with religious belief, medicinal and dietary purpose. The application of this act is the exposure to toxic substances and parasites that are present in the ingested earth [3, 4].

Different names have been ascribed to chalk such as Calabash Stone in English, la craie or Argile in French, Mabele by Lingala in Congo; Nzu in Igbo Ndom by the Efik/Ibibio, Orhe by the Urhobo in Nigeria [1, 2].

The major component of Native Chalk is Aluminum Silicate hydroxide from the kaolin clay group with a possible structural formula of  $Al_2Si_2O_7(OH)_4$  [5].

Traditional ceramics are made from three basic components namely: clay, silica (Flint) and Feldspar. Clay provides workability of the material before firing hardens it. Clay consists mainly of hydrated Aluminum silicate ( $Al_2O_3 \cdot Si_2O_7 \cdot H_2O$ ) with small amounts of other oxides such as:  $TiO_2$ ,  $Fe_2O_3$ ,  $MgO$ ,  $CaO$ ,  $Na_2O$  and  $K_2O$ . [6].

Native chalk, a Geographical material has been reported to contain Lead, Arsenic, Alphalindane, Endrin and Endosulfan (ii) among other pollutants [7].

Chalk alters growth rate and causes de-mineralization in the femur bone of Wistar rats, hence it may be detrimental to bone growth [8].

Lead adversely influences bone development through disruption of mineralization during growth [9].

Reports have shown that chalks alter the normal concentration of red blood cell counts and erythrocyte sedimentation rate (ERS) of female rats [10].

Lead is said to reduce body weight and bone mineral, bone strength, oxidative stress, reduction of zinc, sodium, copper and iron in rats [8, 11, 12].

## 2. Materials and Methods

### 2.1 Physical properties of Native Chalk (calabash Chalk)

Chalk which is white, pasty, naturally very close to the streams or at the bank of the river as a result of the shells which were deposited on the sea bed over a period of time then thrust above sea level were collected from Umutu in Delta state, Benin in Edo state, Port Harcourt in Rivers and Atani in Anambra State. The white-grey chalk was collected after removing the first layer by digging. The chalk is then collected and molded into shapes and allowed to dry in the sun for about 8 days; it becomes sparkling white and light after drying.

The grey type of chalk is edible mainly by pregnant women with the belief that it will strengthen the child in the womb, lessen frequent vomiting and they also believe that it eases the bathing of the child after delivery.

## **2.2 Method of Analysis**

Quantitatively the classical method and the instrumental method are used. The classical methods include the gravimetric and the titrimetric method.

Gravimetric analysis were carried out by precipitating the cations present in each of the sample, dried and weighed for the percentages and the cations calculation.

$\text{HCO}_3^-$  was determine using 5g of the sample dissolved in about 20ml of distilled water and boiled for 10 minutes and filtered. The filtrate in 250 volumetric was diluted to 250ml and mixed by shaking. Two portions of 25ml of each sample solution was titrated with prepared HCl using methyl orange

## **2.3 Sodium Carbonate Extract**

A known amount of sample and an equal amount of sodium carbonate were weight into a beaker, 25ml of  $\text{H}_2\text{O}$  was added and the mixture boiled for two to five minutes. About 10ml of distill water was added to make for water loss by evaporation the mixtures was allowed to cool after which it was centrifuge and decanted.

## **2.4 Sulphate Determination**

1g of the sample of sodium carbonate extract made was diluted with 25ml distilled water and transferred to 400ml beaker. Ammonia was added to remove  $\text{Fe}^{3+}$   $\text{Al}^{3+}$  and  $\text{Cr}^{3+}$ . The precipitate form was filtered out. 3ml 2N HCl (4ml conc. HCl in 20ml distilled water) was added and diluted to 100ml and stirring rod was also added and the beaker was covered with watch glass and heated to boiling point. 5%  $\text{BaCl}_2$  (5g in 100ml water) was added drop wise. The precipitate was allowed to settle after which the supernatant liquid was tested for the presence of Sulphate ion by adding few drops of  $\text{BaCl}_2$  solution. This process continues until all the sulphate has been precipitated. The beaker was covered with watch glass and was kept on a low temperature hot plate for about an hour and was not allowed to boil. The precipitate was **filtered** using a grouch crucible prepared. The crucible and its content was dried at  $130^\circ\text{C}$  to a constant weight and percentage sulphate present where calculated out

## **2.5 Determination of Lead as Lead Chromate**

0.3g sample sodium carbonate extract was made with 25ml of water and transferred to 400ml beaker. This was diluted with water to 100 mark of the beaker. Acetic acid was added until the solution strikingly acidic. Heat was applied to boiling and potassium chromate solution was added to colour the solution slightly orange. The beaker was placed on a steam bath until the precipitate settles (about 10mins). The precipitate was filtered through a prepared sintered glass crucible of known weight. The precipitate was washed thoroughly with hot water to remove any absorbed precipitant. The crucible and its content were dried to a constant weight at  $120^\circ\text{C}$ .

The percentage lead present in the sample was calculated from the lead chromate obtained.

### ***2.6 Determination of Aluminum as Aluminum Oxide***

2g of the sodium carbonate extract was made with 25ml distilled water and was transferred to 400ml beaker. This was diluted with water to 50ml mark of the beaker and a solution of 3g sodium thiosulphate pentahydrate in 100ml water was added. The solution was boiled steadily for about one hour. During this time, the precipitate of hydrated aluminum oxide increases in amount and it is colored yellow by the precipitate Sulphur. Water was added to bring the volume of the content in the beaker to 200ml mark and was kept aside to cool. Then a little ammonium solution was added to the solution and was boiled again. The precipitate was filtered using Whitman no 1 filter paper. The precipitate was washed with hot 2% ammonia nitrate solution to remove any unused sodium thiosulphate. The solution was tested with a little iodine the precipitate was washed continuously until a sample solution decolorized the Iodine solution.

The washed precipitate was also tested for presence of sulphate ions (by acidifying it with HCl and tested with BaCl<sub>2</sub> solution. The filter paper containing the precipitate was heated in an oven at 100<sup>0</sup>C before it was transferred to a crucible for ignition. The Al<sub>2</sub>O<sub>3</sub> was heated to a constant weight from the weight of the aluminum oxide obtained, the percentage Aluminum ions was calculated.

### ***2.7 Determination of Iron as Iron (iii) Oxide***

2g of the sodium carbonate extract was made with 25ml distilled water and was centrifuged. To the carbonate extract solution was added 5ml dilute H<sub>2</sub>SO<sub>4</sub> and 2ml HNO<sub>3</sub> and boiled. A clear solution was obtained. A drop of the clear solution was collected and diluted to 1ml and tested with potassium hexacyanoferrate (ii). Absence of deep blue coloration shows that iron (ii) has completely been oxidized to Iron (iii). The solution of the sample was diluted to 100ml and boiled. The solution which was stirred slowly was added 1:1 ammonia solution and was covered with a watch glass and boiled. The escaping fumes were tested of the presence of ammonia. In absence of ammonia, the supernatant liquid was decanted through funnel. The precipitate was washed with hot 1% ammonium nitrate solution until it no longer give a positive reaction with BaCl<sub>2</sub> acidified with HCl. The filter paper containing the precipitate was heated in an oven at 100<sup>0</sup>C before it was transferred to a crucible for ignition. The Iron (iii) was heated to a constant weight from the weight of the Iron oxide obtained, the percentage Iron (iii) ions was calculated.

### ***2.8 Determination of Calcium using Redox reaction method***

0.2g of the sample was transferred into a (400ml) beaker and covered with a watch glass. A duplicate sample was prepared in another 400ml beaker and this was marked from the first sample. Each sample was covered with water and 1:1 HCl was added to each beaker and warmed until solution was effected. The solutions were diluted to 200ml each. Drops of methyl red were added to both beakers followed by 25ml of ammonia oxalate solution from a burette with constant stirring. Almost boiling solution of the samples was used. During cooling, 1:1 ammonia solution was added until the solution was alkaline (colour change from red to yellow). The beakers covered with watch glass were kept for some time. Decanting of the clear solution or supernatant liquid through

Whatman No40 filter paper was made. The precipitate was washed with several cold waters until no oxalate is detected. The filtrate transferred into 250ml was made up to mark. 25ml of the solution was used for titration with standard  $KMnO_4$  and the ammonia oxalate in the solution was estimated as follows

Weight of weighing bottle & ammonia oxalate minus Weight of weighing bottle & residual crystal and the percentage obtained. For Sample two, the process was the same but the precipitate is dissolved in dilute  $H_2SO_4$  (20ml 2N acid). This was also titrated with  $KMnO_4$ . The percentage of Calcium present in the second sample from the amount of oxalic acid present was calculated. From the experiment of the two samples, the total percentage of calcium was obtained. Digestion of sample for Spectrophotometric analysis, the sample was grinded using a mortar and a pestle. 1g of the powdered sample was weighed into an evaporating dish, 10 ml concentrated  $HNO_3$  was added and the mixture was stirred while maintain the solid at the bottom of the dish.

Evaporating dish with its content was heated almost to dryness it was left to cool after which 20ml distilled water was added to dissolve the solid residue. The solution was transferred to 100ml volumetric flask was made up to mark and shaken properly. The solution was kept for Atomic absorption Spectrophotometric analysis.

### 3. Result and Discussion

The experimental results as shown in table 1 and table 2 shows that native chalk contain metals such as, Pb, Ca, Al and anions such as  $SO_4^{2-}$ ,  $HCO_3^-$  which are present in in large quantity compared with world health organization standard for potable waters. it is established from both the classical and instrumental method that the quantity of iron, Lead, sulphate and calcium found in native chalk exceeded both the maximum allowable and desirable level for water.

However the effect of these metals e.g lead is not quickly noticed in man even though they are present in native chalk which woman eat, is because they not present in solution and powdered but as they continue to used native chalk for medicinal purpose, accumulation of the metals in the body fluid can lead to disease such Siderosis and hemochromatosis caused by excess iron, lead and also inhibit hemoglobin synthesis in mammals and toxic to central nervous system.

**Table 1:** Percentage Compositions of Native Chalk Components Using Gravimetric Methods.

Sample	Pb	Fe	Al	Si	Ca	$HCO_3$	$SO_4^{2-}$
Atani	2.4%	8.04%	12.88%	-	6.33%	2.93%	28%
Benin	4.27%	5.25%	5.2%	-	8.33%	2.93%	37.05%
Port Harcourt	4.27%	3.8%	13.23%	-	6.33%	1.95%	39.1%
Delta	4.27%	7.34%	7.94%		2.65%	3.5%	28%

**Table 2:** Percentage Compositions of Native Chalk Components Using AAS Methods.

Sample	Pb	Fe	$Al_2O_3$	$SiO_2$	Ca	$HCO_3$	S04
Atani	0.1%	4.82%	12.97%	45.56%	-	5.95%	21.4%
Benin	0.04%	6.6%	15.64%	43.0%	-	2.9%	21.0%
Port Harcourt	0.01%	4.3%	14.65%	44.27%	-	7.4%	13.45%
Delta	0.04%	7.6%	11.72%	51.28%	-	7.4%	17.6%

#### 4. Conclusion and Recommendation

The study shows that native chalk which most women eat in Nigeria, contains some metals such as Iron and Lead, calcium, aluminum, silica, Bicarbonate, sulphate among which lead is very toxic. The quantity of this metal present in the native chalk is above maximum desirable level of water. Though chalk also contain some metals such as Calcium, Aluminum, Bicarbonate and sulphate that are within the maximum allowable level, it is obvious that the lead present in the chalk made it hazardous

Traditional users or eaters of native chalk should be educated on the side effect of native chalk. This can be achieved when much investigations are carried out on this area of study and results made known to Government to stop eating of native chalk by the citizen of the nation as eating it will be hazardous to Adult and the unborn children to which pregnant women are protecting.

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