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# The Geochemical Assessment of Sub Surface Coastal Plain Clastic Deposits of Eastern Dahomey, Basin around Lagos Area, South West, Nigeria

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## ABSTRACT

The subsurface coastal plain clastic deposits of Eastern Dahomey Basin around Lagos area was studied using the geochemical analytical method. The investigation determined the distribution pattern of the facies, identified their provenance, and depositional history. Ditch cut samples were collected at every three [3] meters from five [5] different boreholes with their depth of drilling as follows: [AGB – 162.0 meters, KJA – 168.0 meters, VI – 210.0 meters, IKY – 222.0 meters and AJ – 225.0 meters respectively]. Each borehole was subdivided into litho units. Field studies and geochemical composition were conducted to characterize each unit identified. Based on the above parameters, four lithofacies and subfacies were recognized as follows: Sandstone, Siltstone, Mudstone and Clay facies. Geochemical studies revealed that $Sio_2$ has high content [ 80%] and chemical maturity index [CMI] of 12.5% for both sandstone and siltstone facies. This is attributed to the acidic plutonic igneous rocks. The mineralogical analysis revealed an average of 95.8% of quartz, 2.64% of feldspar and 1.5% of rock fragments an indication that the sandstone and siltstone facies are of quartz arenite. The lithostratigraphic facies established the correlation of various units and delineation of the environment of deposition as fluvitile.

**Keywords:** *Coastal Plain Sand, Dahomey Basin, Provenance, Lithofacies, Geochemical composition*

## 1. INTRODUCTION

The understanding of modern sedimentary environment is based mainly on three parameters: physical, chemical and biological characteristics. These could be sub divided into geology, geomorphology, climate, depth, temperature, salinity and fossil remains. These variables are tightly knitted together, in dynamic equilibrium with one another like a thread of spider's web. This is to determine the distribution pattern and identify their provenance, transportational history and depositional environment of the deposits in this area. A conformable vertical sequence of facies was generated by a lateral sequence of environment [Middleton, 1973]. On this basis, it is inferred that each unit in a vertical stratigraphic succession is the product of a particular sedimentary environment and when these units are compiled vertically, they represent a sequence of environment formed by a detailed and general sedimentary process, such as regression and transgression [Nwajide and Reijers, 1996].

Series of research work had been conducted on Dahomey basin, among which are exploration for petroleum by oil companies between 1954 and 1961, leading to the drilling of wells such as Bodashe-1 well, Illepaw-1 well, Afowo well, and Ojo-19 well [Fayose, 1970]. Bassey [1996], stated that the Nigeria coastal region is vested with numerous laden rivers which flows more or less southward through extensive hinterland into adjourning Atlantic Ocean. The sediments so supplied are dispersed by tides generated by long shore drift which flows directly onto the coast. He analyzed the grain size and chemical composition of beach sands in Badagry and Victoria Island of Lagos State. He stated further that the main sediment source is suggested to be of highly metamorphosed rocks and acidic igneous rocks of the adjoining Nigerian basement complex, though some were transported by long shore currents from Ghana-Togo coast to the Lagos shore. The present work aims at assessing the subsurface coastal plain clastic deposits of Eastern Dahomey using geochemical analysis.

## 2. GEOLOGY AND STRATIGRAPHY OF DAHOMEY BASIN

The Dahomey is one of the sedimentary basins on the continental margin of the Gulf of Guinea, extending from southeastern Ghana in the west to the western flank of the Niger Delta [Jones and Hockey, 1964; Omatsola and Adegoke, 1981; [Fig.1]. The basin is bounded in the west by faults and other tectonic structures associated with the landward extension of the fracture zone. Its eastern limit is similarly marked by the Hinge line, a major fault structure marking the western limit of Niger Delta [Adegoke, 1969; Omatsola & Adegoke, 1981]. It is also bounded in the north by the Precambrian basement rock and the Bright of Benin in the south.

Stratigraphic studies of Dahomey basin were conducted by various researchers among whom are Jones and Hockey, [1964]; Adegoke,[1975]; Omatsola and Adegoke,[1981]. The general sequence for the rock unit from the top are the Coastal plain sands, Ilaro formation, Oshosun formation, Akimbo formation, Ewekoro formation, and Abeokuta formation lying on the Southwestern Basement Complex of Nigeria.

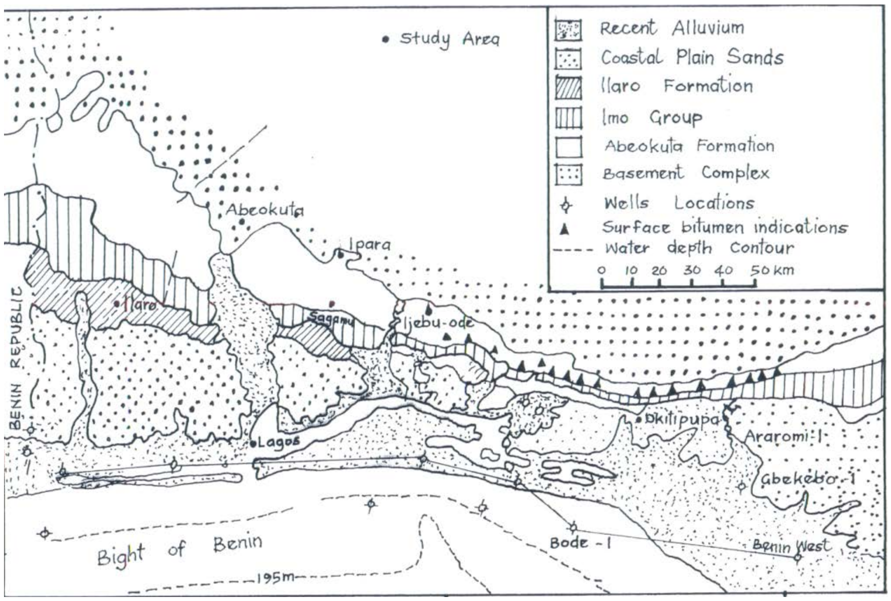


**Figure 1: Geological Map Of The Eastern Dahomey Basin [ After Agagu 1985]**

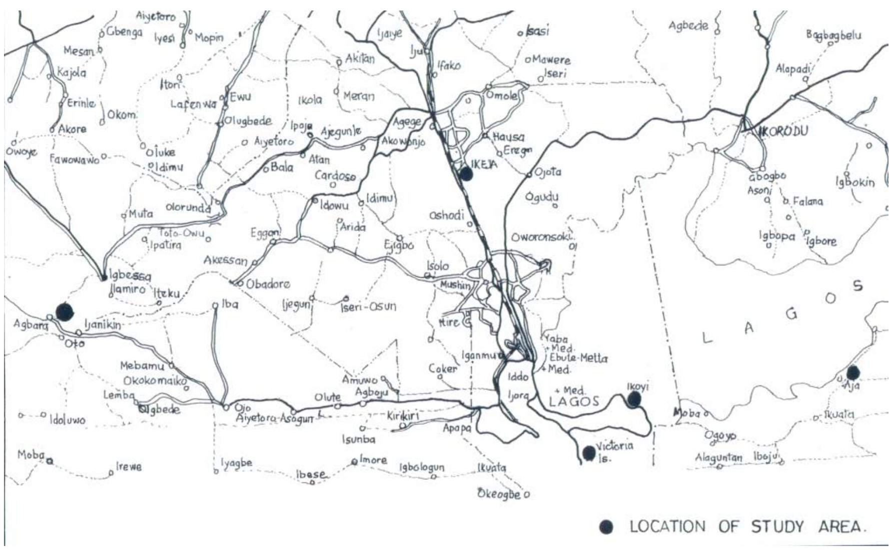


**Figure 2: Sketch Map Of Study Area[ Adapted Fron Lagos Sheet 68, 1st Edition Fed. Surveys Nigeria, 1966]**

## 3. LOCAL GEOLOGY OF STUDY AREA

The study areas are located between between longitude 3° 04' and 3° 35' East and latitude 6° 22'and 6° 41' North, within the south western Nigeria margin. They extend from the western end of Agbara Township to Ajah locality which is situated at the south western part of Lagos State [Fig 2]. Boreholes investigated are located at Agbara Township, Victoria Island, Ikoyi, Ikeja and Ajah locality. These localities are accessible both by major, feeder roads and footpaths. Dahomey Basin covers about

285 kilometers from Cotonou in Benin Republic to the western flank of the Niger Delta [Tiamiyu, 1989].

The lithologic description of the area is based on the studies of the sub surface samples collected from each borehole. Ditch cutting samples were taken at every 3.0 meters from the boreholes and kept in the store of Hydrogeotechniki Nigeria Limited [the drilling company].

## 4. STRATIGRAPHIC PROFILE DESCRIPTION

The top of the section is at the surface level, while the base could not be reached due to the termination of drilling at the depth of 225.0metres. The sections or intervals penetrated by all the boreholes consist of four different facies namely: sandstone facies, siltstone facies, pebbly mudstone facies and claystone facies. The sandstone facies are sub divided into massive sandstone sub facies, graded bedding sandstone unit and poorly stratified sandstone. The sandstone facies constitute about 70% of the facies penetrated [Fig.3]. They are varied in grain sizes from pebbly/conglomeratic to fine grained textures. They are clean, moderately sorted to moderately well sorted with sub angular to rounded grains. Quartz mineral constitute almost 90-96% of the constituents while other minerals such as feldspar, opaque and non opaque heavy minerals, and lithic fragments constitute the remaining percentage. These sandstones are whitish to brownish yellow in colour due to limonitic coating indicative of an oxidized environment.

The siltstone facies are varicoloured and massive. They constitute about 10% of the sequence penetrated, forming part of the fining upward sequence of the sediments. The alternations of the pebbly mudstone and clay stone facies constitute the remaining percentage of the sequence. The mudstone facies are mottled white, dark grayish to black with mud cracking, burrowed and bioturbated structure, whereas the clay facies are variegated with pebbles scattered within the unit.

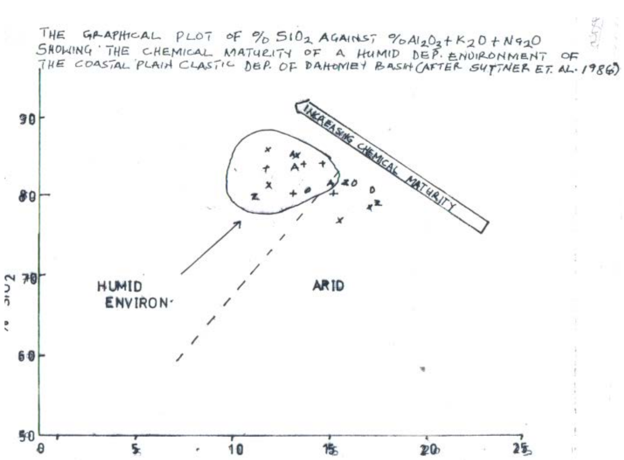


**Figure 3: Graphical Plot of $SiO_2$ Against $Al_2O_3$+$K_2O$+$Na_2O$ Indicating The Chemical Maturity of the Study Area[ After Suttner Et. Al. 1986]**

## 5. MATERIALS AND METHODS

Three hundred and twenty four subsurface soil samples [324] were collected for physical and laboratory analysis as well as lithological and geochemical studies. Precaution was taken during the sample collection not to contaminate them. An average of 30 samples, based on the sub-units established was selected for laboratory analysis. The Atomic Absorption Spectrophotometer [AAS UNICAM 969 MODEL] was used for the geochemical analysis. There was no exposed feature within this study area. Studies were carried out on five borehole samples collected at 3.0 meters interval. The total number of 324 samples collected was later divided into sub-units based on their lithologic characteristics. Dilute hydrochloric acid was used on the sample for possible gas presence. Hand lens and Binocular microscope were also used for mineralogical identification codings.

### 5.1 Geochemical Analysis

The identification of the mineral is usually easy with coarse grained sediments, but for fine grained sediments such as siltstones and sandstones, it is difficult to identify all minerals by ordinary microscopic means. In such instances, chemical analysis becomes the accurate method of classifying the rock according to its lithologic type. Thirty samples were selected for geochemical analysis. The samples were air-dried, crushed using a jaw crasher, and pulverized with the ball milling machine. 10 grams of each sample was weighed and put in a clean digestion bottle. With the aid of a calibrated plastic syringe, 15mls of 40% Hydrochloric acid was added with the help of an automatic pipette, and 10mls of Hydrofluoric acid was also added.

In the process of mixing the two acids, the bottle was tightly closed in order to avoid the escape of silicon=fluoride [SiF4] gas. The digestion bottle was later put on a water bath and warmed up to 70 degree centigrade for about two hours and allowed to cool down to 25- 30 degree centigrade. A 100 mls saturated boric acid was added to the solution and the bottle was closed tightened. The bottle was put on a water bath up to $70^{o}$c until the milky solution became clear. Distilled water was added to it after cooling to make a solution of 250 mls; part of distilled sample was put in a sample container which was then analyzed with a dilution factor of 25. Major elemental oxides such as $SiO_2$, $Al_2O_3$, $K_2O$, $Na_2O$, CaO, MgO, FeO, $Fe_2O_3$ and $TiO_2$ were obtained using

Atomic Absorption Spectrophotometer [Unicam 969 model] with a precision of +0.5.

## 5.2 Mineralogical Analysis

A selective staining technique was utilized to separate quartz, feldspar and rock fragments. The lighter mineral fraction of 2mg were collected and placed in a lead and bath in warm concentrated Hydrochloric acid [HCl] for a minute. After washing, the sample was immersed in one percentage aqueous solution of malachite green for five minutes rinsed and dried. The sample was again mounted on a slide with Canada balsam, and studied under the microscope. Quartz remains unchanged in colour while feldspars stain yellowish and rock fragment stain brown. The relative proportion of different detritus minerals were determined by point counting and results recorded in percentage [Table 4 and 5]

## 6. RESULT AND DISSCUSSION

Table 1 show the result of the geochemical analysis. The result reveals that silica [$SiO_2$] content ranges from 64.06% to 85.43%. The average composition of $SiO_2$ is 80.0% while the average values of the other elemental oxides are $Al_2O_3$[8.60%], $Fe_2O_3$[1.5%], FeO, [0.6%], MgO [0.26%], $K_2O$[0.83%], $Na_2O$[5.82%] and $TiO_2$[0.03%].

Clerk's computation based on 1672 analyses of numerous kinds of granitic rocks arrived at the following as the average percentage composition ($SiO_2$[59.71], $Al_2O_3$[15.41], $Fe_2O_3$[2.63], FeO[3.52], MgO[4.36], CaO[4.90], $Na_2O$[3.55], $K_2O$[2.80], $H_2O$[1.52], $TiO_2$[.60], $P_2O_5$[0.22], total 99.22%). These values are used as bases to justify that the sample in question is from granitic origin.

Lbarede [2003] states that the silica functions principally as an acid forming silicates and all the commonest minerals of igneous rocks are of this nature. The high percentage composition of silica in this study area indicates that the clastic sediments are dominated by quartz grains. This is an indication of quartz arenite composition which is an attribute of acidic plutonic igneous rocks. $Al_2O_3$ ranges from 4.78% to 16.80%, except for AJ/138-144 that shows an anomalously lower value than others. Both $Fe_2O_3$ and FeO constituents are low in all the boreholes, apart from Agbara [AGB] borehole which gives values that are higher [2.92%]. This may have occurred due to the presence of iron oxides such as hematite, magnetite and limonite present as opaque minerals. The Fe- oxides give some of the sandstone and siltstone facies a pronounced reddish brown appearance.
Further interpretation indicates that the average composition of MgO(0.26%), $K_2O$(2.80%), and CaO(4.90%) are low in all the boreholes while the values of $Na_2O$ (5.82%) are relatively higher than these three oxides. The low level of $Al_2O_3$, $K_2O$ and $Na_2O$ (8.60%, 0.83% and 5.82%) respectively tally with the low level of the feldspar present in the clastic deposits. The most spectacular of the oxides is $Na_2O$ [5.82%], of whose average composition is relatively higher than that of the other oxides, except $Al_2O_3$ [8.60%] in most of the samples. This according to Boles [1982] could be related to the albitization of feldspar that is common in the diagenesis or due to low grade metamorphism of these rocks and /or occurrences as post depositional constituents from the eustatic changes in the sea level of the Atlantic Ocean and Lagos lagoon. $TiO_2$ is rare to absent in some locations as shown in Table 2.

The presence of $Al_2O_3$ can also be linked with aluminosilicate minerals including feldspar which are present in a very small quantity. CaO is suggestive of a cementing agent that binded the grains and matrix together. The MgO is associated with smectic and chloritic clays [Pettijohn, 1975]. The titanium oxide [$TiO_2$] occurs in trace to rare, the source of which is acclaimed mostly with the heavy minerals such as rutile and ilmenite because of its association with rare elements. Rocks which contain mostly silica, and on crystallizing yield free quartz, form a group generally designated as "acid" rocks. In acid rocks the common feldspars are orthoclase, microcline, and oligoclase all having much silica and alkalis.

It is established that the bulk chemical composition of sandstone and siltstone facies are indication of paleo climate in terms of its chemical maturity. Peters [1978] states that chemical maturity is expressed in terms of the $SiO_2$ contents while chemical maturity index [CMI] is expressed as a ratio of $SiO_2/Al_2O_3$ [Fig 5]. The high $SiO_2/Al_2O_3$ ratio ( 85.43%) and the high silica content ( 80.0%) of these sediments reveal that they are deposited under the most intensive weathering condition and have silica content comparable to quartz arenite [Suttner and Dutta, 1986].

A plot of $SiO_2$ values against the total percentage values of $Al_2O_3$ + $K_2O$ + $Na_2O$ shows the trend of chemical maturity as a function of climatic environments for the samples plotted. The low values of oxides such as $Al_2O_3$, CaO, $K_2O$ and $Na_2O$ support the low percentage of feldspar as computed in the recalculated values of mineralogical composition of sandstone and siltstone facies [Table 5]. The level of the $Na_2O$ suggests the infiltration of saline water from both the Atlantic Ocean and lagoon as post depositional event.

Results from the mineralogical composition revealed an average of 95.80% of quartz, 2.64% feldspar and 105% of rock fragments of the sandstone and siltstone facies to be quartz arenite The ternary plots of framework grains of the sandstone facies and the relation of framework grains of sandstone and tectonic setting is shown in figures 6. The sandstone and siltstone facies are therefore classified as quartz arenite [folk, 1974].

## 7. CONCLUSION AND SUGGESTION

The study area is lithologically made up of four lithofacies namely: sandstone facies, siltstone, mudstone and clay facies which are cyclically [either singly or repeatedly] arranged with fining upward sequences. The high percentage composition of silica indicates that the clastic sediments are dominated by quartz grains which are indicative of quartz arenite composition. The chemical maturity of sandstone and siltstone facies establish the paleo-climate to be of humid depositional environment. The high $SiO_2/Al_2O_3$ ratio (85.43%) and the high silica content (80.0%) of these sediments reveal that they are deposited under the most intensive weathering condition and have silica content comparable to quartz arenite. The level of the $Na_2O$ suggests the infiltration of saline water from both the Atlantic Ocean and lagoon as post depositional event.

Facies analysis is an important concept of stratigraphic and sedimentary geology, which provides a methodology of systematic description that is fundamental to orderly stratigraphic documentation and they indicate depositional environment. It is therefore suggested that detailed subsurface geological and geophysical studies of these areas be carried out to obtain substantial information about the subsurface geology and the probability of discovery of hydrocarbon deposits.

## REFERENCES


[1] ADEGOKE, O. S. 1970. Microfauna of the Ewekoro formation Paleocene of S.W. Nigeria. Afr. Geol. Ibadan Pp. 265-276.

[2] BASSEY C. E. 1996. Grain size analysis and heavy mineral composition of Beach Sand in Victoria Island area of lagos S.W. Nigeria,

[3] AJST Series B, Vol.8, No 1 pp 11-14 D. H.N.

[4] BOLES, J. O. 1982. Active albitization of plagioclase, gulf coast Tertiary. Am. Jour. Sci. 282, pp 165-180

[5] FASOYE E. A. 1970. S TRATIGRAPHIC paleontology of Afowo – 1 well S.W. Nigeria Journ. Min and Geol, vol, pp 166 -171.

[6] JONES H.A. and HOCKEY R. D. 1964. The geology of part of S. W. Nigeria, Geol. Surv. Nigeria, Bull 31, 87p.

[7] MIDDLETON G, V. 1973. JOHANNES Walters law of the correlation of facies. Geol. Amer. Bull., vol. 84, pp 979-988

[8] LBARÈDE, F. (2003). *Geochemistry: An Introduction*. Cambridge University Press. p. 1. ISBN 0-521-81468-5.

[9] NWAJIDE and REIJERS 1996. Chapters on Geology – Sedimentary Geology and sequence stratigraphy in Nigeria. Three case studies and field guide SPDC Spec. pub. Warri 198p.

[10] OMATSOLA M.E. and ADEGOKE S. O. 1981. Tectonic evolution and Cretaceous stratigraphy of the Dahomey Basin Jour. Min. Geol. Vol. 18[1], pp. 130-136.

[11] PETERS, S. W. 1978. Stratigraphic evolution of the Benue Trough and its multiplication for the upper cretaceous paleogeography of West Africa jour. Geol., vol. 86 pp 311-322

[12] PETTIJOHN F.I. 1975. Sedimentary Rocks [3RD Ed.] Harper and row, New York 628p

[13] TIAMIYU A.1989. The ecology and distribution of foraminifera in Lagos habour, Nigeria. J. Min. Geol., vol 25[1&2], pp 183-189.

[14] SUTTNER L. J. and DUTTA P. K. 1986 Alluvial sandstone composition and paleoclimate 1. Framework mineralogy. Jour. Sed.petrol vol 56, pp 329-345.

**Table 1: Major Compositional Elements**

| | AGB/30-48 | AGB/54-60 | AGB/78-84 | AGB144–156 | KJA/33-51 | KJA/66-72 | KJA117-123 | KJA132-141 | VI/8-21 | VI/33-64 | VI/60-90 | IKY/54-66 | IKY/66-87 | IKY150-207 | AJ/42-54 | AJ/90-102 | AJ/144-180 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $SiO_2$ | 82.09 | 80.95 | 73.6 | 80.5 | 81.2 | 81.5 | 79.7 | 82.6 | 83.7 | 85.0 | 81.1 | 84.6 | 82.8 | 80.8 | 75.5 | 79.9 | 83.9 |
| $Al_2O_3$ | 4.78 | 8.09 | 8.8 | 8.2 | 9.4 | 7.9 | 6.7 | 6.1 | 6.7 | 8.1 | 9.5 | 6.5 | 7.4 | 9.5 | 11.8 | 12.9 | 6.9 |
| $Fe_2O_3$ | 2.03 | 2.92 | 2.8 | 1.2 | 0.9 | 1.1 | 0.6 | 1.5 | 1.3 | 1.7 | 1.1 | 1.3 | 1.1 | 0.9 | 1.8 | 1.1 | 1.4 |
| FeO | 0.92 | 0.35 | 0.6 | 0.4 | 0.5 | 0.3 | 0.4 | 0.6 | 0.8 | 0.5 | 1.0 | 0.6 | 0.5 | 0.4 | 0.8 | 0.5 | 0.7 |
| MGO | 0.33 | 0.29 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 | 0.4 | 0.2 | 0.3 | 0.2 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.3 |
| $K_2O$ | 0.52 | 0.38 | 1.1 | 1.2 | 2.5 | 2.4 | 1.9 | 2.3 | 0.7 | 0.6 | 0.35 | 0.7 | 1.3 | 0.3 | 0.3 | 0.3 | 1 |
| CaO | 0 | 1.21 | 1.4 | 0.2 | 0.0 | 0.7 | 1.0 | 0.5 | 4.0 | 0.07 | 0 | 1.2 | 1.6 | 0 | 0.0 | 0 | 0.1 |
| $Na_2O$ | 6.45 | 5.2 | 4.6 | 6.8 | 5.9 | 8.8 | 3.3 | 4.7 | 8.0 | 6.0 | 6.4 | 3.6 | 4.7 | 5.3 | 5.7 | 4.7 | 4.1 |
| $TIO_2$ | 0.01 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0 | 0.0 | | 0.0 | 0 | 0.1 | 0 | 0.1 |
| TOTAL | 97.23 | 100 | 97.7 | 100 | 100 | 99.3 | 96.6 | 99.7 | 100 | 99.7 | 100 | 98.4 | 99.5 | 97.5 | 96.0 | 98.6 | 98.5 |
| $SIO_2/AL_2O_3$ | 12.07 | 17.17 | 10.5 | 8.4 | 7.1 | 8.7 | 10.4 | 11.3 | 12.4 | 12.5 | 7.0 | 12.9 | 11.3 | 8.5 | 6.3 | 7.9 | 12.5 |
| $K_2O/AL_2O_3$ | 0.09 | 0.11 | 0.1 | 0.1 | 0.3 | 0.2 | 0.3 | 0.5 | 0.51 | 0.32 | 0.1 | 0.2 | 0.4 | 0.1 | 0.0 | 0.0 | 0.1 |
| CaO/MgO | 0.007 | 0.003 | 4.3 | | | 4.2 | 8.2 | 1.0 | 0.0 | 3.3 | 6.5 | 9.7 | 13.3 | 0.0 | 0.0 | 0.3 | 0.0 |
| $K_2O/Na_2O$ | 0.08 | 0.08 | 0.1 | 0.1 | 0.2 | 0.2 | 0.4 | 0.22 | 0.6 | 0.51 | 0.1 | 0.2 | 0.3 | 0.3 | 0.5 | 0.1 | 0.2 |

**Table 2:Modal Composition of the Coastal Plain Clastic Deposits of Eastern Dahomey Basin S. W. Nigeria**

| SAMPLE | QUARTZ | FELDSPAR | MICA | LITHIC FRAGMENT | FOSSIL FRAGMENT | TOTAL |
|---|---|---|---|---|---|---|
| AGB/6-18 | 94.82 | 2.86 | - | 2.32 | - | 100 |
| AGB/30-48 | 96.48 | 2.80 | - | 1.56 | - | 100 |
| AGB/48-54 | 96.70 | 1.37 | - | 2.43 | 0.05 | 100 |
| AGB/54-60 | 97.50 | 2.20 | - | 2.30 | - | 100 |
| AGB/72-84 | 97.87 | 1.52 | - | 0.61 | - | 100 |
| AGB/144-156 | 96.80 | 2.03 | 0.01 | 1.16 | - | 100 |
| KJA/24-30 | 98.51 | 1.05 | - | 0.44 | - | 100 |
| KJA/39-51 | 97.50 | 1.92 | - | 0.58 | - | 100 |
| KJA/51-57 | 98.56 | - | - | 1.44 | - | 100 |
| KJA/66-72 | 99.85 | 0.15 | - | - | - | 100 |
| KJA/84-144 | 99.72 | - | 0.02 | 0.28 | | 100 |
| KJA/117-123 | 96.42 | 2.64 | 0.02 | 1.92 | - | 100 |
| KJA/126-129 | 98.59 | 0.03 | - | 1.36 | 0.01 | 100 |
| KJA/132-141 | 99.22 | 0.92 | - | 0.13 | | 100 |
| KJA/153-159 | 97.84 | 0.52 | - | 0.56 | 1.00 | 100 |
| VI/27-33 | 95.75 | 2.55 | - | 1.50 | 0.20 | 100 |
| VI/60-63 | 94.80 | 2.05 | - | 1.50 | 1.10 | 100 |
| VI/96-105 | 95.38 | 2.8 | - | 1.82 | 0.01 | 100 |
| VI/180-198 | 96.10 | 3.64 | 0.01 | 0.21 | 0.25 | 100 |
| VI/198-210 | 95.10 | 2.45 | - | 0.25 | 1.20 | 100 |
| IKY/3-6 | 92.32 | 2.02 | 1.29 | 0.57 | 3.80 | 100 |
| IKY/36-66 | 96.18 | 2.07 | - | 0.25 | 1.50 | 100 |
| IKY/66-87 | 98.22 | 1.20 | - | 0.38 | - | 100 |
| IKY/102-114 | 97.50 | 1.42 | 0.01- | 0.38 | | 100 |
| IKY/144-150 | 96.13 | 2.38 | - | 0.86 | - | 100 |
| IKY/150-198 | 97.57 | 1.80 | - | 0.63 | 0.01 | 100 |
| IKY/207-222 | 97.83 | 1.74 | - | 0.43 | - | 100 |
| AJ/0-15 | 96.09 | 2.63 | 0.50 | 0.77 | 0.01 | 100 |
| AJ/21-30 | 93.10 | 2.70 | - | 0.75 | 1.02 | 100 |
| AJ/90-102 | 95.75 | 2.50 | - | 1.70 | | 100 |
| AJ/144-168 | 95.56 | 2.25 | - | 0.94 | 0.25 | 100 |
| AJ/222-225 | 97.98 | 1.50 | | 0.52 | - | 100 |

**Table 3: Standard For Granitic Rocks Used As Comparative Basis For The Coastal Plain Clastic Sediment Of The Study Area**

| % CLERKS STANDARD | ANALYTICAL RESULT |
|---|---|
| $SiO_2$ 59.71, | 80.0 |
| $Al_2O_3$ 15.41, | 8.60 |
| $Fe_2O_3$ 2.63 | 1.5 |
| FeO 3.52, | 0.6 |
| MgO 4.36, | 0.26 |
| CaO 4.90 | - |
| $Na_2O$ 3.55 | 5.82 |
| $K_2O$ 2.80 | 0.83 |
| $H_2O$ 1.52 | - |
| $TiO_2$ 0.60, | 0.03 |
| $P_2O_5$ 0.22, | - |
| Total 99.22% | |