

## **1.1 INTRODUCTION (GENERAL STATEMENT)**

Palynology is the study of micro organic material such as pollen grains and other spores especially as found in geological deposits. They are important group of microfossils and in general, are important tools for the petroleum industry, finding practical uses in all stages of the exploration process. Prior to drilling, micropaleontological methods can aid the acquisition of geological field data and enhance the quality of the reservoir potential assessment by way of sequence stratigraphic correlation, paleogeographical and facies analysis, depositional and source-rock maturation determination as well as migration modeling (Jenkins, 1993). The accuracy and profitability of the drilling process itself can benefit from micropaleontological monitoring through the analysis of ditch cuttings, essentially allowing age determination, correlation of wells, unconformity evaluation, paleoenvironmental interpretation and lithostratigraphic as well as depositional sequence characterization.

Finally, in the "post"-drilling stage of the exploration, comprising appraisal and development, the evaluation of microfossils is imperative for setting up detailed stratigraphic subdivisions and modeling reservoir connectivity. Pollen extracted from such deposits may be used for radiocarbon dating and for studying past climates and environment by indenting the plant. Pollen and spores are transported by wind and water and can travel long distances before final deposition. They are surprisingly resistant to decay and are common as fossils. Because of the long transport before deposition, they usually tell us little about the environment of deposition, but they can be used for biostratigraphy. Fossil pollen and spores can also give us information about ancient climates.

Palynological studies in Nigeria are largely confined to the Tertiary Niger Delta, where numerous studies have been carried out following the discovery of petroleum resources in the Niger Delta in the late 1950s. The Niger Delta Basin is economically important because of its petroliferous nature; the economy of Nigeria depends largely on the oil and gas derived from it. Up to 12km of Late Eocene-Recent deltaic and shallow marine sediments have accumulated in the triangular-shaped basin in a series of southerly prograding off lapping cycles (Michele et al.). The combination of source rock, lithologic types, structures and thermal history of the basin are favorable for the generation, accumulation and retention of hydrocarbons (Whiteman Stacher Sonibare and Ekweozor).

Additionally, the organic chemicals which comprise palynomorphs get darker with increased heat. Because of this color change they can be used to assess the temperature to which a rock sequence was heated during burial. This is useful in predicting whether oil or gas may have formed in the area under study, because it is heat from burial in the Earth that makes oil and gas from original organic rich deposits (Asheesh, 2008). Some geological fields in which palynology can be applied to, here are the major fields:

Geochronology

Biostratigraphy

Paleoecology

Geochronology - dating of rocks. Palynoflora are used to date rocks. Palynomorphs are great indicators of narrow time ranges because of the rapid evolution of the samples. Because they are present in rocks that don't usually have fossils, the microscopic fossils are used as a time range instead of waiting for complicated lab results.

Biostratigraphy - correlation of rock sections. This aspect of palynology is the most important economically. Proper identification of indicative palynomorphs could lead to the discovery of oil, coal, and gas deposits. In fact, fossilized pollen was first discovered in a coal thin section. Because pollen and spores have the tendency of being dragged along with migrating petroleum through porous rocks - they are good indicators that petroleum isn't too far away. The small sizes of palynomorphs are ideal for drill core samples. The coloration and type of palynomorphs represents the thermal maturity and hydrocarbon potential of the area.

Paleoecology - past environments. Because palynomorphs are sensitive to any minor fluctuation in their surroundings, they are highly indicative of the environment in which they are deposited. The advantage of palynomorphs over other fossils is their widespread distribution; they can be found in either terrestrial, freshwater, saltwater, or estuary sources of sedimentary rocks.

## **1.2 AIM AND OBJECTIVES**

This study is primarily aimed at using palynomorphs (pollens and spores) in order to achieve the following objectives:

- To establish biostratigraphic zonation
- To determine the relative age of the studied well ( age dating )
- To interpret and reconstruct the depositional environments

## **1.3 SCOPE AND METHODS OF STUDY**

- i). Obtain well cutting samples from four wells
- ii). Prepare and analyze the samples for their palynological content
- iii). Interpret the analyzed samples in line with standard palynological methods
- iv). Present the results using statistical models
- v). Draw up conclusions from the findings
- vi). Present the report as a dissertation.

## **1.4 LOCATION AND ACCESSIBILITY**

The study area is located in the offshore western Niger Delta area of Nigeria. The Niger Delta is situated in the Gulf of Guinea on the west coast of Central Africa. Niger Delta lies between latitudes 4° and 6° N and longitudes 3° and 9° E in the south-south geo-political region of Nigeria (Ojo et al, 2009). The Cenozoic Niger Delta is situated at the intersection of the Benue Trough and the South Atlantic Ocean where a triple junction developed during the separation of South America and Africa in the Late Jurassic (Whiteman, 1982).

## **1.5 TOPOGRAPHY AND DRAINAGE**

In the drainage of the Niger Delta, the river Niger drains the eastern flank of the state and discharges into the sea through its several distributaries such as the Forcados, Escravos and Warri Rivers and creeks such as Bomadi creeks amongst other. Low relief and poor drainage result to erosion and flooding leading to coastal area been flooded and low availability of land for farm purpose.

## **1.6 CLIMATE, VEGETATION AND OCCUPATION**

The vegetation of the Niger Delta consists mainly of forest swamps. The forest is of two types, nearest the sea is a belt of saline/brackish mangrove swamp separated from the sea by sand beach ridges within the mangrove swamp. Numerous sandy islands occur with fresh water vegetation. Fresh water swamps gradually supersede the mangrove on the landward side. The Niger delta is a rich mangrove swamp in the

southernmost part of Nigeria covering over 20,000kmsquare.

The major occupation of the people in the region is fishing, agriculture and the region is abundantly blessed in this respect.

### **1.7 PAST WORK OR LITERATURE REVIEW**

Three depositional cycles and lithostratigraphic subdivision of upper sandy continental Benin Formation, intervening unit of alternating sandstones and shales (Agbada Formation) and lower shaly Akata Formation have been identified in the Niger Delta area (Short & Stauble, 1967; Avbovbo, 1978, etc.). The structural geology, sedimentology and petroleum geochemistry of the Niger Delta have been published by several workers (Tuttle, et al., 1999; Weber & Daukoru, 1975, etc.). The accumulation and retention of hydrocarbons was published by (Whiteman Stacher Sonibare and Ekweozor). In addition, the biostratigraphy and sequence stratigraphy of the Niger Delta have been studied (Ozumba, 1999; Adeniran, 1997; Petters, 1982, etc

## **USING PALYNOMORPHS (POLLENS AND SPORES) TO BIOSTRATIGRAPHIC ZONATION**

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