

REFERENCES

- Abele, L. G. (1972). The status of *Sesamma angustipes* (D), *S. trapezium* (D) and *S. miersii* (R): Decapoda, Grapsidae in the western Atlantic. *Carib. J. Sci.* 12: 165-170.
- Abele, L. G. (1976). Comparative species composition and relative abundance of decapod crustaceans in marine habitats of Panama. *Mar. Biol.* (Berl.). 38: 263-278.
- Bayagbona, E. O., Sagua, V and Afinowi, M. A. (1971). A survey of the shrimp resources of Nigeria. *Mar. Biol.* (Berl.). 11: 178-189.
- Bright, D. B and Hogue, C. L. (1972). A synopsis of the borrowing land crabs of the world and list of their arthropod symbionts and burrow associates. *Contributions in Science*. No. 220. Nat. Hist. Mus. Los Angeles County. 57pp.
- Hagen, H. V. (1978). The tree climbing crabs of Trinidad. *Studies on the fauna of Curacao and other Caribbean Islands*. No. 175: 26-59.
- Hartnoll, R. G. (1965). Notes on the marine grapsid crabs of Jamaica. *Proc. Linn. Soc. Lond.* 176: 113-147.
- Malley, D. F. (1977). Adaptations of decapod crustaceans to life in mangrove swamps. *Mar. Res. Indonesia*. No. 18: 63-72.
- Rathbun, M. J. (1918). The Grapsoid crabs of America. *Bull. U.S. Nat. Mus.* 97: 1-461.
- Rathbun, M. J. (1921). The brachyuran crabs collected by the American Museum Congo expedition. *Bull. Amer. Mus. Nat. Hist.* 43: 379-468.

Figs. 3. *Callinectes*; 4. *Cardisoma*; 5. *Uca*; 6. *Goniopsis*; 7. *Chiromanthes*; 8. *Holometopus*; 9. *Panopeus*.
Horizontal scale = 1cm.

Clays and Afikpo Pottery in South-eastern Nigeria

by I. Arua

(Department of Geology, University of Nigeria, Nsukka)

O. K. Oyeoku

(Department of Fine and Applied Art, Advanced Teachers College,
Akwanga, Jos, Nigeria)

INTRODUCTION

Clay is the raw material in pottery. The term is not easy to define precisely because it has a number of technical meanings which are not identical. Potters apply the term to fine-grained rocks which when suitably crushed and pulverised became plastic when wet, leather-hard when dried and turn into a permanent rock-like mass when fired (Grimshaw 1971). Clays in their natural form may consist of many different minerals and may be found in a variety of forms such as a soft paste known as mud or as a soft solid called mudstone or as a laminated rock, the shale. Many of the properties of clays depend on the nature and amounts of the various minerals and varying proportions of impurities in them which determine the kind of ceramic it is used for. Under ceramics one understands in a general sense materials and articles made from naturally occurring earths. The term is largely synonymous with pottery. It ranks as one of man's earliest scientific

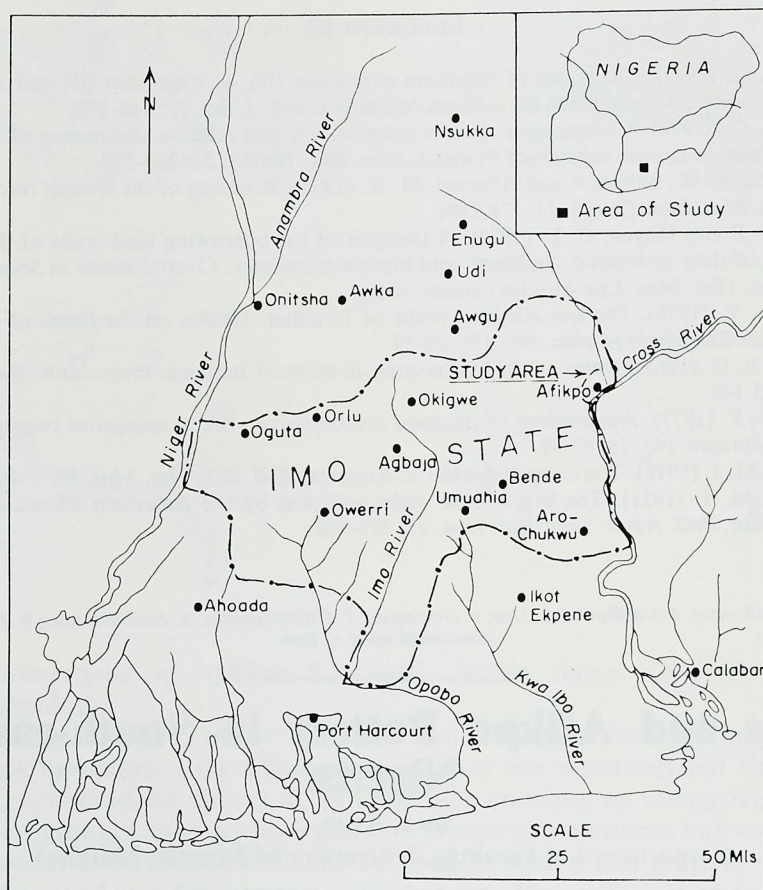


Fig. 1. Location of the Imo State including the study area.

achievements which has survived the rigours of thousands of years. The chief constituents of all kinds of pottery are the clays. They and their products are of very great importance to many industries.

The present discussion focuses the first attempt to provide a comprehensive account of experimental investigations involving determination of chemical, physical and ceramic properties of Afikpo clays and a study of the traditional pottery in Afikpo. Such an account should lay the foundation for improving the materials and techniques presently employed in this craft in the area of study.

PHYSIOGRAPHY OF AFIKPO

The name Afikpo is applied to a village-group located between latitudes $5^{\circ}52'N$ and $5^{\circ}54'N$ and between longitudes $7^{\circ}53'E$ and $7^{\circ}55'E$ on the west bank of the Cross River in the Imo State of Nigeria (Fig. 1). It is made up of 22 villages which vary greatly in size, being composed of from several hundred to over two thousand inhabitants (Fig. 2).

Topographically, it falls within the low-lying Cross River plain. The relief of the area is undulating due to the difference in lithology. Sandstone ridges attain heights of about 350ft above sea level while the lowlands, which are traversed by small, mostly seasonal streams, extend about 150ft above sea level.

CLAY DEPOSITS

The stratigraphic horizons in the area of investigation consist of sediments belonging to the Nkporo Formation and its lateral equivalent the Afikpo Sandstone of Upper Campanian to Maastrichtian age. The depositional environment of both ranges from shallow marine to brackish water. The Nkporo Shale is made up of dark grey to black coloured shales with imparted brownish coloration which may be due to weathering of shale to the siderite bearing clays with their characteristic buff appearance. The shale runs as a narrow band north of Afikpo town and occupies a large expanse of land west and south-west of it (Fig. 3). It has a high water content; hence it is plastic in nature. The clays exhibit colours which vary from dark grey to grey and brownish red. They are usually found immediately below lateritized over-

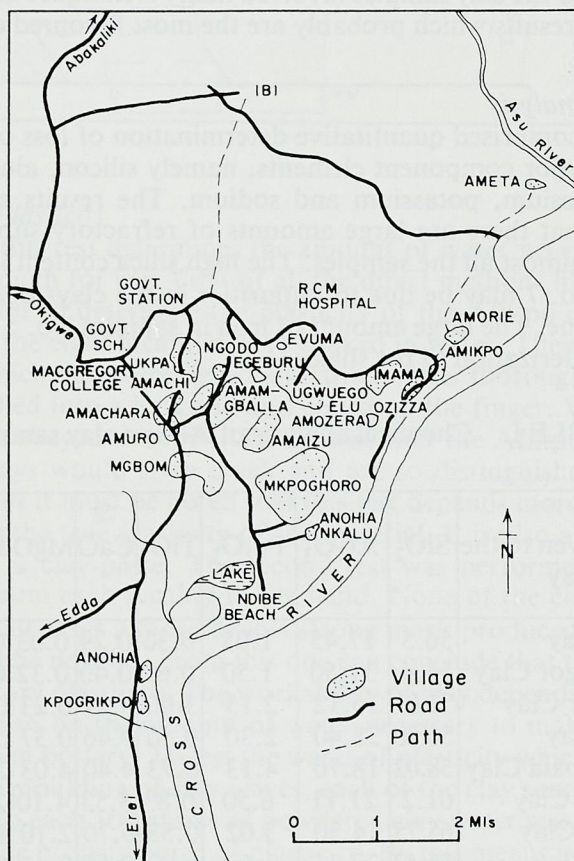


Fig. 2. Afikpo Village - Group.

burden containing ironstone nodules and thin ironstone bands. The thickness varies from a few cm to as much as tens of metres. Exposures of clay are very common in the Afikpo area. Most famous are the ones along the valley of the Uji Stream behind "Francis Ibiam girls' Secondary School" which is situated between Amizu and Mgbom villages. Others are found around the Afikpo High School and between Oziza village and RCM Hospital.

FIELD PROCEDURES

Samples from eight different localities (Fig. 3) were collected during the fieldwork. To get a fairly representative sample for analysis clay was taken from many different parts of a horizon in a clay deposit. The preliminary sample composed of numerous smaller ones was thoroughly mixed and treated as the original material.

ELEMENTAL ANALYTICAL METHODS

The analysis of the clay samples involved many techniques mostly designed to obtain quick results which probably are the most favoured control tool of potters.

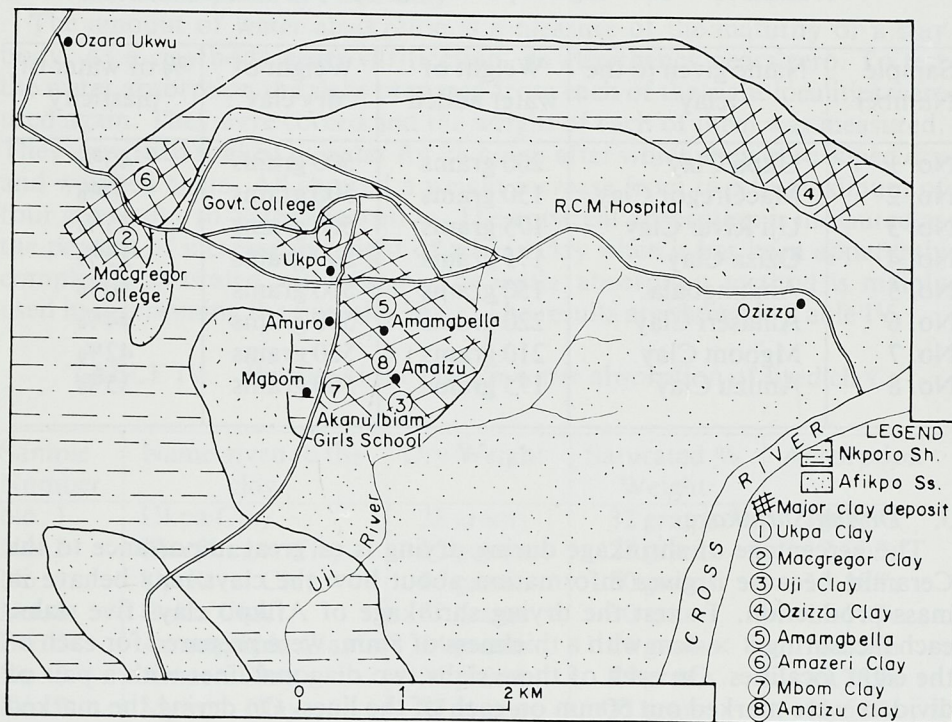
1. Chemical Analysis

The analysis comprised quantitative determination of loss on ignition and oxides of the major component elements, namely silicon, aluminium, iron, titanium, magnesium, potassium and sodium. The results summarized in Table 1 show that there are large amounts of refractory substances— SiO_2 and Al_2O_3 —in almost all the samples. The high silica content in samples No. 3, No. 6 and No. 7 may be due to impurities in the clays derived from the Afikpo Sandstone. The large amount of iron in samples No. 5 and No. 6 can be ascribed to laterization of the shales.

TABLE I. Chemical analysis of Afikpo clay samples

Sample Number	Name given to the clay	SiO_2	Al_2O_3	Fe_2O_3	TiO_2	CaO	MgO	K_2O	Na_2O	I.L. Loss on ignition
No. 1	Ukpa Clay	56.5	17.45	1.05	0.30	0.29	0.03	0.14	0.04	14.20
No. 2	MacGregor Clay	54.4	31.50	1.50	0.60	0.40	0.32	0.23	0.15	10.90
No. 3	Uji River Clay	71.01	15.12	2.15	3.00	0.21	0.23	0.20	0.11	8.02
No. 4	Oziza Clay	56.20	28.40	2.30	0.50	0.46	0.37	0.25	0.02	11.50
No. 5	Amangbala Clay	58.02	18.70	4.13	0.73	4.40	4.03	2.05	2.30	5.64
No. 6	Amaseri Clay	61.2	21.11	6.50	0.83	3.53	4.10	2.70	0.91	9.12
No. 7	Mgbom Clay	65.75	14.30	3.02	0.53	0.70	2.10	1.04	0.15	12.41
No. 8	Amizu Clay	55.42	27.05	3.50	0.90	0.56	0.43	0.32	0.21	11.61

Fig. 3. Geology of Afikpo area including major clay deposits & sample location.



2. Water of Plasticity

The aim of this test determines the amount of water necessary to make a clay plastic enough for use. First of all the direct methods like in rolling out test and feet test to determine the plasticity of the Afikpo clays were used. Samples from the eight localities were soaked in water. They all slaked in 24 hours, after which they were sieved and dried. After thorough kneading each sample was rolled into a long roll and coiled on the finger. Without a single crack the clays obeyed the twist. This shows that the Afikpo clay is plastic. Less plastic clays would soon crack and are so distinguishable from more plastic ones. But it must be noted that this test depends more on the binding power than on the true plasticity of the material. It is also a measure of the consistency of a clay-paste. The second test was performed in pressing a piece of clay from each locality in the hand. None of the clays stuck to the fingers and in all cases a more or less strong mark produced by the lines of the hand could be noticed. From this one can conclude that the Afikpo clays are of satisfactory plasticity. The workability of clay depends not only on its plasticity but also on the amount of water necessary to make a clay plastic enough for use in pottery. To test the water of plasticity which is of value for controlling the moulding of clay waves, each of the clay sample was crushed into powder. To each 500 grams of powdered clay water was added until the mass reached the proper degree of plasticity. By this means it was possible to determine the water plasticity of each clay sample as shown on Table II.

TABLE II. Showing the percentage of water of plasticity

Sample Number	Name given to the clay	Weight of water added	Weight of dry clay	% of water of plasticity
No. 1	Ukpa Clay	200 grams	500 grams	40%
No. 2	MacGregor Clay	150 grams	500 grams	30%
No. 3	Uji River Clay	175 grams	500 grams	35%
No. 4	Oziza Clay	175 grams	500 grams	35%
No. 5	Amamgbala	150 grams	500 grams	30%
No. 6	Amaseri Clay	220 grams	500 grams	44%
No. 7	Mgbom Clay	210 grams	500 grams	42%
No. 8	Amizu Clay	175 grams	500 grams	35%

3. *Drying Shrinkage*

The percentage of shrinkage during drying is of great importance to the Ceramist because it gives information about how the clays may behave in mass production. To test the drying shrinkage of Afikpo clays five slabs, each measuring 8 × 4cm with a thickness of 8mm, were prepared for each of the eight localities. On each of these slabs two diagonal lines with a pair of dividers were marked out 50mm on each of the lines. On drying the marked lines were measured out to give the dry shrinkage. This test only gives an idea of the progressive tightening of the clay particles with rise in temperature but it does not show the total shrinkage of the clay since more shrinkage occurs when the clay is fired at high temperatures. Therefore all the slabs were fired at a temperature of 1060°C and the diagonals were measured again giving the firing shrinkage. The results of the tests are given in Table III.

TABLE III. Results of the Shrinkage Test

Sample Number	Name given to the clay	Marked length of slab	Dry Length	Fired Length	% of Total Shrinkage	Raw Colour	Fired Colour
No. 1	Ukpa Clay	50mm	44mm	42mm	16%	Grey	Red
No. 2	MacGregor Clay	50mm	46mm	45mm	10%	Grey	Red
No. 3	Uji River Clay	50mm	47mm	45mm	10%	Grey	Buff
No. 4	Oziza Clay	50mm	48mm	44mm	12%	Red	Red
No. 5	Amamgbala Clay	50mm	48mm	46mm	8%	Black	Red
No. 6	Amaseri Clay	50mm	45mm	41mm	18%	Red	Red
No. 7	Mgbom Clay	50mm	47mm	44mm	12%	Brown	Buff
No. 8	Amizu Clay	50mm	48mm	46.5mm	7%	Grey	Buff

4. *Water Absorption of Fired Clay*

The amount of water absorption is a measure of the maturity of a clay body. As a clay body nears vitrification, its absorbency nears zero. To test the water absorption the slabs prepared from each of the eight localities were used again. They were cooled and the weight of each of them was measured. They were then soaked in water for 24 hours after which they were wiped dry and weighed again. All showed a weight increase from two to maximum of four grams due to water absorption. The apparent absorption is measured as the percent of increase in weight of a fired clay when it has been apparently completely saturated with water. The water absorption method is mainly used in determining the porosity value. The results are shown in Table IV.

TABLE IV. Results of the test for water absorption of fired clay

Sample Number	Name given to the clay	Dry Weight	Saturated % Weight	Absorption
No. 1	Ukpa Clay	28 grams	32 grams	14.28%
No. 2	MacGregor Clay	25 grams	28 grams	12.00%
No. 3	Uji River Clay	26 grams	30 grams	15.38%
No. 4	Oziza Clay	27 grams	30 grams	11.11%
No. 5	Amamgbala Clay	24 grams	26 grams	8.33%
No. 6	Amaeri Clay	26 grams	29 grams	19.23%
No. 7	Mgbom Clay	27 grams	31 grams	11.54%
No. 8	Amizu Clay	25 grams	27 grams	8.00%

EVALUATION

Before any definite statements can be made about the industrial potentialities of the clay from Afikpo area it would be necessary to carry out comprehensive studies of many more samples. However on the limited data obtained from the analysis one comes to the following conclusions.

1. Generally the Afikpo clays have a high silica content and are quite rich in fluxing elements. They could be very useful for the manufacture of domestic and sanitary earthenwares.
2. Because of the high ratio of silica and alumina to fluxes of TiO_2 , CaO , MgO , K_2O and Na_2O the clays would require over-average high firing temperatures specially if used for bricks.
3. The shrinkage of the Ukpa and Amaseri clay is higher than average and may need the adding of grog to the clays before use.
4. The montmorillonite content in some clays causes the requirement of much water to saturate the clay and thereby giving it a plasticity that is required for moulding. On the other hand the rather low percentage of water of plasticity in a few samples is brought about by its high quartz grain content.

5. The dominant red or buff colour in all the samples is due to iron oxide produced at comparatively low temperature.
6. The porosity in the Afikpo clays is high. But they could still be used for common bricks if the pores are minute. The porosity would be very suitable for the manufacture of bricks which have to be resistant to changes in temperature.

TRADITIONAL POTTERY

The Afikpo people have always been very proud of their pottery which has been handed down from generation to generation up to the present day. Wares dating back to 2935 B.C. being of very high standard in craftsmanship have been excavated from their area (Hartle 1960). It is believed that pottery-making was introduced to Afikpo by a group of people called Ndiagu who settled there after having been taken war prisoners by the Afikpo people. Being great craftsmen they started also practising pottery. As they integrated with the Afikpo society, the women of Afikpo began to learn pottery-making from Ndiagu women. It is notably interesting that pottery since generations ago up till now is exclusively for women in Afikpo.

CLAY QUARRYING

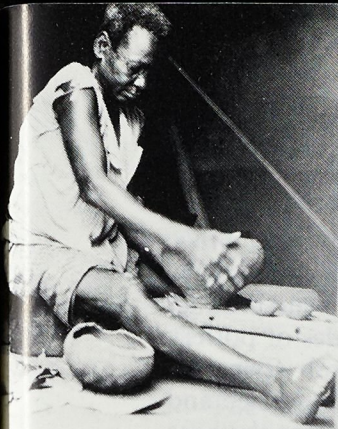
By Afikpo tradition, as already mentioned, the clay quarrying is done by women only and males are not allowed to visit the quarry. In this regard it is believed that if a man visits the quarry, he defiles it by so doing and consequently the wares made out of clay from such a quarry will not survive firing.

Afikpo clay quarrying method is still very primitive. Implements used for mining include hoes, knives and sticks for scooping out the clay by manual labour. The clay is then transported by head to the homes of the potters for storage until it is used for pottery. Before clay is quarried sacrifices are made by potters to the goddess of pottery called "Ovuatamara". It is situated at Amizu village in Afikpo. These offerings are made to ensure a successful work.

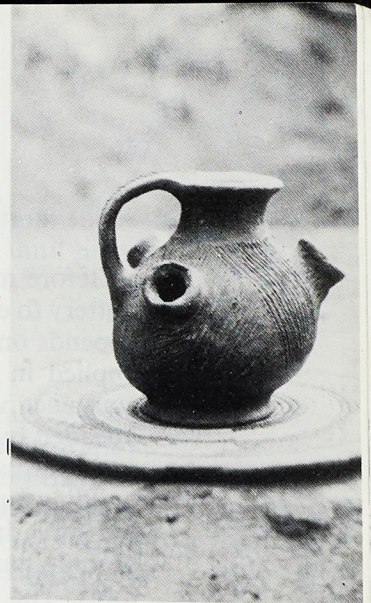
PREPARATION OF CLAY FOR POTTERY

Some potters in Afikpo use clay directly from the mines for work while others prefer to store the clay for a few days to age before use. Most Afikpo clays are very plastic and therefore some potters add a yellow sandstone powder which they produce by grinding up sandstones also found in the Afikpo area. The sandstone powder reduces the plasticity and shrinkage of the clay and makes the wares harder. The mixture of clay and sandstone powder is then kneaded by foot until it attains workability and is ready for use. Pebbles and other impurities are removed during kneading.

Fig. 4. Afikpo potter in action. Fig. 5. Preparation for the firing of the pottery wares. Fig. 6. Drawing of wares before cooling. Fig. 7. Abstract decorations on a water jug. Fig. 8. Decoration on a vase. Fig. 9. Broken water jug shows red colour paintings made from camwood. Fig. 10. Different signature designs scratched to the rim of the wares. Fig. 11. Cooking pots and small soup bowls. Fig. 12. Soup bowl with cover mainly for the family head.



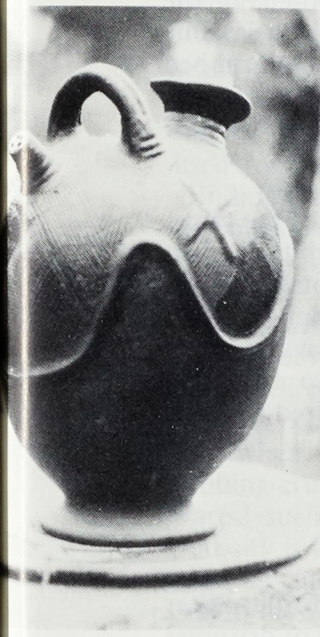
5



8

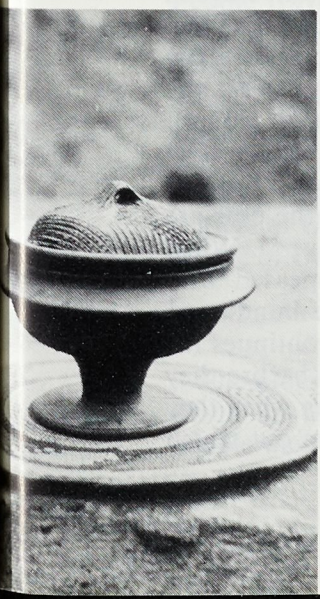


6

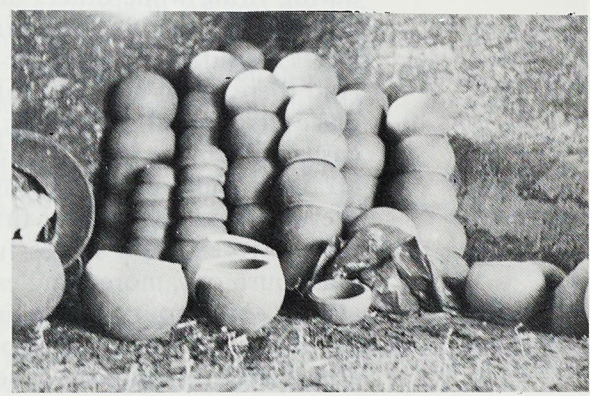


9

10



12



11

MODELLING

Before modelling their wares, offerings are made again to the goddess of pottery to ensure a successful work because it is believed that the end product depends on the wishes of the goddess. There are only two modes of pottery applied in Afikpo. Namely the coiling and the pinching. Both styles are combined when working on a ware. After the clay body has been mixed and kneaded by the potter, she then begins her pot making by pinching the base and gradually coils the clay spirally and sticks it together (Fig. 4). After building up to the rim, the pot is allowed to set so that it can bear the pressure during smoothening. After about one day when it must have become hard enough the final shape and size is achieved by using certain tools. The tools are very simple but serve adequately the purpose. For the scraping off excess clay a wooden spatula is used. The burnishing is done with an empty mussel shell or the back of a piece of calabash which is rubbed on the surface of the pot until it has got the lustrous appearance of terra sigilatta wares. Bits of slim sticks and corn cobs are used for decoration of wares.

Traditional pottery-making is seasonal and follows the trend of the rains. It flourishes during the dry season when the rains will not disturb their open air firing. When the rains come, only a few people make pots and they restrict their production to small wares which dry fast enough despite the fact that the humidity is usually very high during that time. Such wares made during the rainy season are fired in small numbers in order to accelerate firing which helps to reduce the amount of wood and grass required for each firing because it is difficult to find them during this season.

FIRING METHODS

The pottery wares are fired in the open by means of wood firing. After modelling, while the wares are drying, the potters collect bundles of dry grass and firewood for the firing. Firing is regarded as the most important stage in their pot-making. Some potters invite their friends or relatives to help them during firing while others organize their firing in groups. Firing is usually done in the evening in special firing grounds. If the potter thinks that the wares are sufficiently dry for firing they are then moved to the firing ground. And there again men are not allowed to visit the site of firing. The potters place first a layer of bundles of wood on the ground facing all directions to ensure free movement of gas during combustion. On this layer the pots are arranged and bundles of grass are then laid on top of them (Fig. 5). When everything is set for the firing, the goddess of pottery is appeased with prayers to ensure a successful firing. The firing begins. As the bundles of grass burn out, more bundles of grass are added. This process continues for at least three hours. After firing, the wares are allowed to cool before they are drawn. Some impatient potters draw the wares before cooling when they are still red hot (Fig. 6). They use long sticks for hooking them out which

results very often in shattering of the wares because of the thermal shock. After cooling, the wares are carried on the head home for storage until such a time they are taken to the market for sale.

QUALITIES OF AFIKPO WARES

The style of pottery in Afikpo has not changed over the years but one notices an advancement in technical proficiency due to experimentation. Even though there is a great variability in quality in Afikpo pottery there is a striking textural quality which is evident in all Afikpo wares. Usually Afikpo wares are thick and heavy. The rim is always thicker in order to lend strength to the wares. Generally, only the upper third of the pots are decorated with horizontal running impressed lines.

Most of the decorations are abstract and are used for their aesthetic values while others are used for their functional values (Figs. 7 and 8). As far as Afikpo pottery is concerned there is not much variety in colour. Very often a red colour made from camwood and a white colour prepared from clay are used for the decoration (Fig. 9). Occasionally a yellow paste obtained by grinding dried roots of a certain tree mixed with water is used. All paintings on pots are usually done after firing.

Each ware has a signature design which is used by individual potters as a trade mark. The mark is scratched with a sharp instrument close to the rim on the outside of the ware (Fig. 10). Very often the finishing ware has a number of irregular patches varying in colour from grey to black which result from the iron content and sometimes carbon material of the clay.

A big problem to Afikpo potters is the porosity of their wares. Most pots leak when water is stored in them. Although they are combating this by rubbing crushed leaves of a certain plant called NLO by the natives on the wares' surfaces not much success has been achieved. One reason of the porosity is the low firing temperature of the wares. As far as their firing is open air and the period of firing short, it may not be possible to raise the quality of wares in this respect. Of high quality is the cooling ability. The capillary spaces in Afikpo wares cause them to have high cooling ability. People travel from faraway places to Afikpo to buy these water coolers. There is a high degree of specialization in Afikpo pottery due to the restrictive nature of Afikpo customs. The main types of pots made in Afikpo are big pots for water storage, small cooking pots, bowls for bathing, eating plates and various types of ritual pots (Figs. 11 and 12). One can easily tell in what part of Afikpo a pot is made because the people of Ndibe, Amizu and Mgbom villages specialize in making cooking pots and bowls of small size. Potters of Ukpa and Amachara village make big pots for water storage while people of Oziza make bowls for bathing and big pots for water storage.

MARKETING

The oldest market for pottery is at Ndibe beach on the coast of the Cross River. In those days potters exhibited their pots which were bought by middle-men for retail in distant markets. These middle-men loaded the wares

in canoes and paddled along the Cross River. Today the Cross River is still a favourable market trade route. On one trip, which takes about three weeks, a canoe takes about 150 pots and each is sold for One Naira 50K. Other areas where Afikpo pots are marketed include Abiriba, Ohafia, Arochukwu and Edda. The transportation of the wares to these markets is done by Edda market women who buy their pots from Afikpo and transport them by head-load to the centres for retail. With the introduction of enamel and plastic wares there has been considerable decline in pottery trade and many customers have changed to the use of these new utensils.

CONCLUSION

As a result of the presence of extensive clay deposits in Afikpo and of the enthusiasm for their craft shown by the potters there is the possibility of considerable room for expansion, especially if one realises that pottery is completely centred on the cultural heritage of Afikpo and that the wares form part of the material culture. There are various steps which could reduce the problems of pottery in Afikpo and also pave the way to modernisation. Modern potters should be posted to the rural areas to help educate the natives on new techniques of pottery-making which involves the use of throwing wheels and the construction of kilns. But the educator must be sensitive enough to learn and adapt to the local style too. It was this type of assistance which was given to potters of Abuja, the area of the new federal capital of Nigeria, and ever since they have been popularized as a result of the synthesis of traditional and modern pottery methods.

REFERENCES

- Forde, D. and Jones, G. I. 1950. The Ibo and Ibibio-Speaking Peoples of South-Eastern Nigeria. (International African Institute, Ethnographic Survey of Africa, Western Africa, Part III.) London: International African Institute.
- Grimshaw, R. W. 1971. The chemistry and physics of clays and allied ceramic materials, 4th Ed., Erust Benn Limited.
- Hartle, D. 1966. Archeology in Eastern Nigeria. West African Archeological Newsletter, No. 5.
- Kogbe, C. A. and Okeudu, O. E. 1977. Carthographic and Stratigraphic investigations around the Afikpo-Amaseri area (South-Eastern Nigeria). Paper presented at the 13th Annual Conference of the Nigerian Mining, Geological and Metallurgical Society (NMGMS). Ahmadu Bello University, Zaria.
- Ogbukagu, I. N. 1974. Preliminary investigation on the beneficiation of some Cretaceous shales in parts of the East-Central State. Journal of Mining and Geology. Vol. 8, No. 1.
- Ottenberg, S. 1971. Readership and Authority in an African Society: The Afikpo village group. (American Ethnological Society Monograph 52.) Seattle and London: University of Washington Press.
- Ottenberg, S. 1975. Marked rituals of Afikpo. Published for the Henry Art Gallery by the University of Washington Press, Seattle and London.
- Oyeoku, O. K. 1976. Pottery making in Afikpo. Unpubl. B.A. Thesis, University of Nigeria, Nsukka.
- Telkins, St. A. 1971. Abuja: Continuing a Nigerian Tradition. Interlink, Vol. 7, No. 1.