International Journal of New Technology and Research (IJNTR)
ISSN:2454-4116, Volume-4, Issue-3, March 2018 Pages 78 -80

Laboratory Investigation of the Effect of Chikoko Mud on the Compressive Strength of Portland Cement Concrete

Captain G Ottos, Daniel Nyebuchi

***Abstract*— In this paper, the compressive strength of chikoko blended cement concrete is investigated. The test results show that the replacement of cement with chikoko mud reduces the compressive strength at a uniform rate of 4%, 10%, 15%, 24% and 37% respectively for 7, 14, 21 and 28 days curing as the content of chikoko increases. The trends of the results are reflections of the predictable properties of concrete with supplements and as a result, it can serve as a useful tool for assessment of chikoko mud. Also at 10%, the minimum strength of 20.38N/mm^2 was observed at 7days curing while maximum strength was 26.49N/mm^2 at 12 days curing. The study therefore has revealed that chikoko mud can be used for mass concrete and non-load bearing structures at 10% replacement.**

***Index Terms*— Chikoko, Compressive Strength**

I INTRODUCTION

Chikoko mud is soft marine clay found in Niger Delta area of Nigeria. It is a highly fibrous organic soil consisting mainly of vegetative matter. Chikoko mud is a natural pozzolant that has been used in concrete productions.

Ordinary Portland cement (OPC) is used as binder in the production of all concrete elements in the world. It has a lot of problems with the economy and environment during and after production. The production process of OPC produces a lot of carbon dioxide emissions. This emission according to [1] is roughly one ton of each ton of cement produced. Therefore, the amount of Portland cement used if reduced by the use of alternative materials; the carbon dioxide emissions produced will reduce.

In Nigeria the price of cement is rising every day. Thus, concrete structures and houses to accommodate the growing population are difficult to build [2]. There are no cost control systems in place to control the cost of cement therefore the economic use of cement can be achieved by considering partial replacement in producing some concrete elements. According to [3], there is an immediate need to explore the potentials of local materials such as chikoko to replace cement partially in the construction industries without adversely affecting the quality and strength of concrete in terms of his properties.

Pozzolanic materials have so many advantages. [4] stated that slow hydration is an advantage of using supplementary materials like pozzolants, which implies that there is low rate of heat development which is of great significance in construction works especially in the tropical regions.

This paper aims at investigating the effect of chikoko mud on the compressive strength concrete.

Ottos, Captain Gospel, Department of Civil Engineering, Rivers State University, Port Harcourt, Nigeria
Daniel Nyebuchi, Department of Civil Engineering, Rivers State University, Port Harcourt, Nigeria

II. MATERIALS AND METHODS

A. Materials

Chikoko Mud

The chikoko mud was obtained in from the mangrove swamp at Eagle Island in Port Harcourt City Local government Area of Rivers State. It was dried for three one month after which it was ground and sieved with a 75micron sieve to obtain finer particles and the chemical and physical properties analysis was done also to determine its suitability for use as a pozzolanic material. See table 1 and 2.

Table 1 Chemical Properties of Chikoko mud

Chemical Properties of Chikoko mud		
S/n	Component	Content (%)
1	CaO	9.80
2	SiO_2	41.21
3	Al_2O_3	10.13
4	Fe_2O_3	2.29
5	MgO	5.01
6	Na_2O	1.92
7	K_2O	9.10
8	SO_3	0.08
9	TiO_2	0.71
10	ZnO	0.09
11	LoI	6.61

Table 2 Physical Properties of Chikoko mud

Physical Properties of Chikoko mud		
S/N	Physical Property	Test Result
1	Standard Consistency	31.90%
2	Fineness	10.98%
3	Specific Gravity	0.93
4	Initial Setting time	29mins

Cement

Dangote cement was used in this research. The cement was gotten from the mile 3 market in Port Harcourt.

Physical properties of the cement are presented in table 3 below.

Table 3 Physical Properties of Cement

Physical Properties of Cement		
S/N	Physical Property	Test Result
1	Standard Consistency	30.00%
2	Fineness	5.00%
3	Specific Gravity	3.2
4	Initial Setting time	28mins

Aggregates

Fine aggregates (FA) and coarse aggregates (CA) were obtained from mile 3 building material market. Table 4 and 5 respectively shows their properties.

Table 4 Physical Properties of fine Aggregates

Fine Aggregates		
S/N	Physical Property	Test Result
1	Specific Gravity	2.44
2	Fineness Modulus	4.5

Table 5 Physical Properties of coarse Aggregates

Coarse Aggregates		
S/N	Physical Property	Test Result
1	Specific Gravity	2.58
2	Fineness Modulus	5.4
3	Water Absorption	0.90%

Methods

In this study the aim was to achieve a good and consistent tests result for paving blocks with the replacement of OPC with chikoko. Chikoko with the required fineness was collected for use. The mix design ratio of 1:1.5:3 with water binder ratio of 0.55 was used in this work after carrying out trial mixes of different water binder ratio ranging from 0.45 to 0.60. Twelve samples were casted for each percentage replacement making a total of 72 concrete cubes of 150x150x150mm in size using varying OPC: PKSA ratios of 100:0, 95:5, 90:10, 85:15, 80:20, and 75:25 respectively. Curing and casting of cubes were done after 7, 14, 21 and 28 days respectively to define the compressive strength.

III. RESULTS AND DISCUSSION

After curing the cubes of chikoko blended cement concrete for 7, 14, 21 and 28 days, specimens were placed on the compression testing machine and load was applied. The results shown in table 6 were used in plotting the graph shown in Figure 1.

Table 6 Mechanical Analysis Result Summary

MECHANICAL ANALYSIS RESULT SUMMARY				
	Compressive strength N/mm^2			
% PKSA	7 days	14 days	21 days	28 days
0	24.64	26.12	28.31	30.67
5	23.04	24.52	26.71	29.07
10	20.38	21.86	24.05	26.41
15	18.15	19.63	21.82	24.18
20	14.6	16.08	18.27	20.63
25	9.22	10.70	12.89	15.25

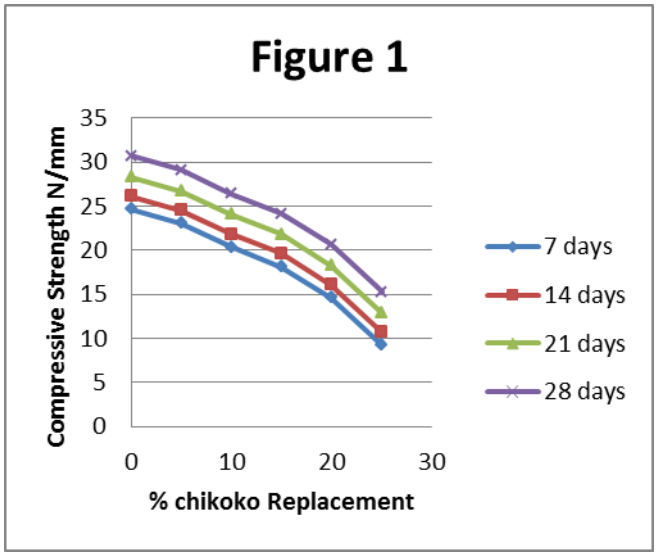

Figure 1: Effect of chikoko on compressive strength

The compressive strength of paving blocks for various replacement proportions are given in Table 6. The results show that for paving blocks without chikoko, the compressive strength values are relatively higher as compared to paving blocks containing chikoko. It was also observed that, compressive strength decreases with increase in chikoko content. The reduction in compressive strength with respect to control sample without chikoko is 4%, 10%, 15%, 24% and 37% respectively. This was observed to be uniform across the different days of curing. It can be seen that beyond 10% the Compressive strength reduced below acceptable limit to be used for any kind of structural element.

IV. CONCLUSION

From the study carried out the following conclusions are made.

1. The chikoko concrete cubes gave strength values at 10% replacement, with a minimum value of 20.38N/mm^2. This shows that at 10% it can be used for mass concrete and non-load bearing structures between 7 and 28 days curing.
2. The compressive strength of chikoko concrete decreased with increase percentage replacement.

REFERENCES

[1] Malhotra, V.M. (2000) "Role of Supplementary Cementing Materials in Reducing Greenhouse Gas Emissions". In *Concrete Technology for a Sustainable Development in the 21st Century*. ed by Gjorv, O.E, and Sakai K. London: E & FN Spon, 226-235

[2] Osadebe, N. N. and Obam, S. O."Improvement in the Properties of Concrete by Partial Substitution of Ordinary Portland Cement Rice Husk Ash", Proceedings of Annual Conference of IRDI Science and Technology Forum, University of Nigeria Nsukka. 2(2), pp 87-91. 2006.

[3] Otoko, G. R. "On The Economic Use of Cement in Soil Stabilization", International Journal of Engineering and Technology Research, Vol2. No.1, pp 01-07. 2014.

[4] Otoko, G. R. and Chinwah, J. G. "The use of Garri as Admixture in Hot Weather Concreting", The Journal of Nigerian Institute of Structural Engineers, Vol.1, No.4, pp 13-18. 1991.