As per UGC guidelines an electronic bar code is provided to seure your paper

International Journal for Modern Trends in Science and Technology, 7(12): 195-199, 2021

ISSN: 2455-3778 online
DOI: https://doi.org/10.46501/IJMTST0712037
Available online at: http://www.ijmtst.com/vol7issue12.html

Experimental Investigation on Mechanical Properties using Coconut Shell and Copper Slag as a Partial Replacment in Concrete

G Swarup Kumar and P Sailu

Department of Civil Engineering, Visakha Technical Campus, Andhra Pradesh, India

To Cite this Article

G Swarup Kumar and P Sailu. Experimental Investigation on Mechanical Properties using Coconut Shell and Copper Slag as a Partial Replacment in Concrete. *International Journal for Modern Trends in Science and Technology* 2021, *7* pp. 195-199. https://doi.org/10.46501/IJMTST0712037

Article Info

Received: 12 November 2021; Accepted: 05 December 2021; Published: 13 December 2021

ABSTRACT

India is producing lots of waste materials and by products by abundant industries. Dumping of waste materials misuse may attack the environment in environment in numerous zones. Copper slag is an industrial by-product Material manufactured during the smelting and refining process of copper. Fine aggregate is restored with copper slag with dissimilar percentage like 0%, 20%, 40%, 60% & 80% respectively by weight. Agriculture waste increasing very high. Coconut being hard and it can't degradable easily so here coconut shells (CS) which is UN contaminating material which gives high compressive strength. Coarse aggregate is re-established with coconut shell. It is return with different percentage like 0%, 10%, 15%, 20%, 25%, 30%, 35% & 40% respectively. The w/c ratio for all the mix kept constant. The strength properties test were conducted for fresh and hardened concrete for 7 days&28days

KEYWORDS: Copper slag, coconut shell, Master glenium ACE 30

INTRODUCTION

Increase in population leads to decrease in consumption Materials. Human being mainly needs the shelter due to the increase in population there is a decrease in construction materials .To minimize this problem civil engineers focus on the waste materials or reused Material which can be replaced partially in concrete.

Present coconut shell is one of the major waste disposals all over the world. When coconut shell is burned it release harmful gases like carbon dioxide and methane which impacts the environment. The ash is not safe for disposal. Therefore to alternate this problem the coconut shell can be replaced with coarse aggregate. Coconut shell can satisfy all the properties of the concrete. It also has high workability due to the smoothness of the surface on one side. It also light weights the aggregate in structural concrete hence; it reduces the material cost in construction.

Copper slag is obtained from industries which are a by-product Material produced during the smelting and refining process of copper. The waste it can be partially replaced with fine aggregate. Copper slag has the same properties of fine aggregate. Disposal of this material can cause environmental pollution. So to reduce this problem we can partially replaced with fine aggregate.

LITERATURE REVIEW:

Abhisheka H et al the result of compressive strength, split tensile strength and flexural strength and concrete

shown higher value at 40% replacement of fine aggregate by using copper slag.

Ch srinivas et al found that the compressive strength of cement mortar with 50% replacement of natural sand by manufactured sand reveals sand reveals higher strength as compared to reference mix.

Chandraul kirti et al The result of the compressive strength of concrete cubes show the compressive strength up to 40% replacement gives good results and highly reduced as % of coconut shell increase after 40%.

P. Ashok et al found that the eco friendly waste material coconut shell ash and coconut shell is used effectively for light concrete. The results obtained shows that coconut shell ash and coconut shell without any processessing may replace by cement up to 15% by its weight.

priyanka A. Jadhav et al he concluded that The compressive strength of cement mortar with 50% replacement of natural sand by manufactured sand reveals higher strength as compared to reference mix.

Yogesh narayan sonawane et al research work have on coconut shell can be used where light weight concrete is required. Proper bonding between coconut shell and cement is not possible because of surface area of coconut shell aggregate. In future, we can increase strength of coconut shell concrete by adding admixtures

METHODOLOGY:

a) Literature review
b) Collection of materials
c) Tests and results

- Replacing coconut shell in place of coarse aggregate with 0%,10% , 15%, 20%, 25%, 30%, 35% & 40%respectively
- Replacing copper slap in place of fine aggregate with 0%, 20%, 40%, 60% & 80% respectively
- Using combination of coconut shell and copper slag

EXPERIMENTAL PROGRAM:

The physical properties tests have done are shown below

a) CEMENT

They are two types of ordinary Portland cement and Portland pozzolanic cement. Ordinary Portland cement is used OPC53 conforming to Indian standard code IS: 12269 were used in concrete. The physical properties of cement are mentioned in table1.

TABLE 1: PHYSICAL PROPERTIES OF CEMENT

S.NO	PROPERTIES	RESULTS
1	Specific gravity	3.13
2	Fineness	96%
3	Standard consistency	30%
4	Initial setting time	31min
5	Final setting time	274min

b) FINE AGGREGATE

River sand is used in this project, zone-II, and conformed to Indian Standard Specifications IS: 383-1970. The properties are shown below in table2

TABLE 2: PHYSICAL PROPERTIES OF FINE AGGREGATE

S.NO	PROPERTIES	RESULTS
1	Appearance	Grainy and white
2	Specific gravity	2.69
3	Fineness modulus	3.08
4	Water absorption (%)	0.7%
5	Bulk density (gm/cc)	2.77gm/cc

c) COPPER SLAG

It is the by-product of industrial waste which is produced during the copper smelting and refining process. It is partially replaced with fine aggregate which have same fine aggregate properties the following properties are shown below in table3

FIG.1.COPPER SLAG

TABLE 3: PHYSICAL PROPERTIES OF COARSE AGGREGATE

S.NO	PROPERTIES	RESULTS
1	Appearance	Black and glassy
2	Specific gravity	3.47
3	Fineness modulus	2.21

S.NO	PROPERTIES	RESULTS
1	Specific gravity	1.30
2	Fineness modulus	2.77
3	Water absorption (%)	22%
4	Bulk density(kg/m^3)	863
5	Crushing value (%)	2.6
6	Impact value (%)	25
4	Water absorption (%)	0.17%
5	Bulk density (gm/cc)	2.083gm/cc

d) COARSE AGGREGATE

Coarse aggregate retained on Is 4.75mm sieve and its maximum nominal size is 20mm used in the concrete

S.NO	PROPERTIES	RESULTS
1	Specific gravity	2.73
2	Fineness modulus	2.70
3	Water absorption (%)	2.30%
4	Bulk density(kg/m^3)	1875.6
5	Crushing value (%)	21.44
6	Impact value (%)	7.06

for 70% & remaining 30% coarse aggregate used is 10mm tests are conducted as per is 383-1970. The properties are shown in table4

TABLE 4: PHYSICAL PROPERTIES OF FINE AGGREGATE

e) COCONUT SHELL

Coconut shell is brought from the oil industries. After bringing the material we broke the shell with the help of hammer into piece and other shells Were crushed in the crushing machine after the piece are obtained sieving have done and segregated into 20mm& 10mm.The properties are mentioned below in table5

FIG.2.COCONUT SHELL

TABLE 5: PHYSICAL PROPERTIES OF COCONUT SHELL

f) WATER

The water should be free from acids, harmful measure of oil and inorganic pollutants.

PREPARATION OF CUBES

Two type of materials are used in Project are fine aggregate and coarse aggregate In this experimental work cement is kept constant in all the mixes and copper slag is replaced in place of fine aggregate partially with types percentages and also coconut shell is used in place of coarse aggregate partially with different ratios

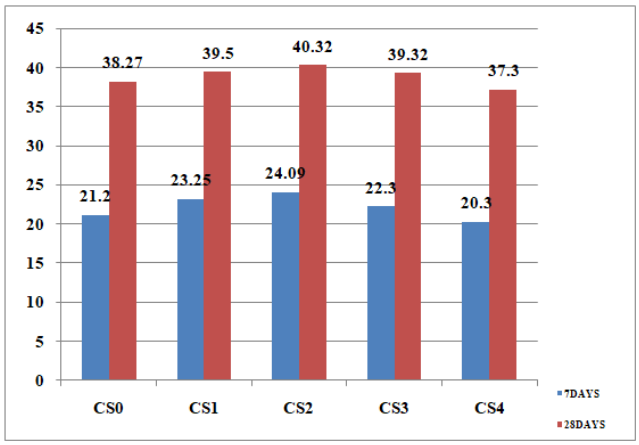
The mix design is done as per is 10262-2009. In all the mixes w/c ratio is kept constant and the cubes size is 150mm*150mm*150mm. cubes are cured for different durations. The design mix is shown in table6

TABLE.6.Mix proportions obtained from mix design of M30

Water Content (litres)	CEMENT (Kg/m^3)	FINE AGGREGATE (Kg/m^3)	COARSE AGGREGATE (Kg/m^3)
152	355	660	1292
0.43	1	1.86	3.64

6. RESULTS AND DISCUSSIONS

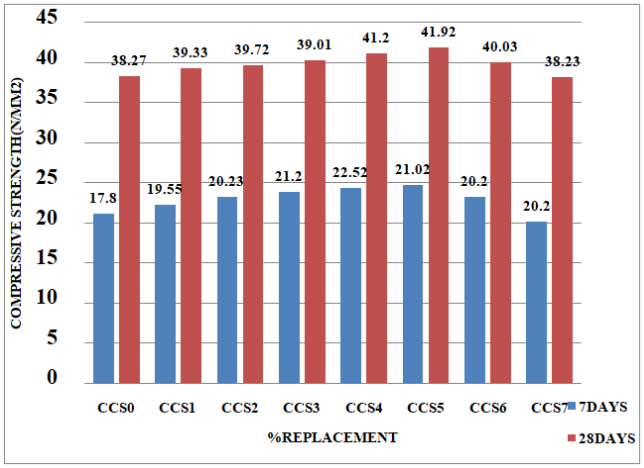
The compressive test results are shown below,



GRAPH.1.VARIATION OF COMPRESSIVE STRENGTH USING COPPER SLAG(CS)

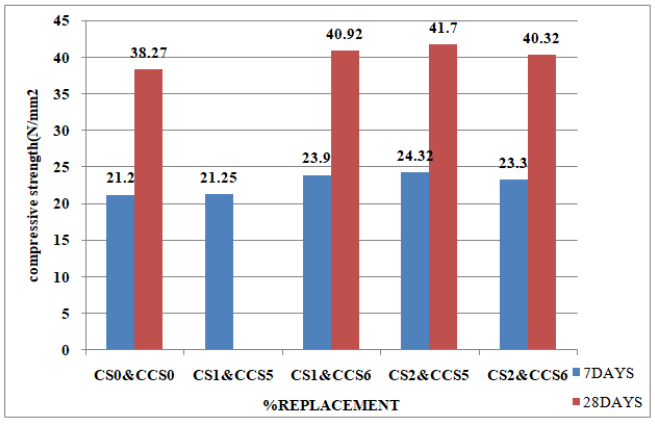
From the graph1.the compressive strength using copper slag .The extreme value get as far as for 7days &

28 days are 24.09N/mm² & 40.32N/mm² are at 40% replacement with copper slag



GRAPH.2.VARIATION OF COMPRESSIVE STRENGTH USING COCONUT SHELL(CCS)

From the graph2.The compressive strength using coconut shell The maximum value reached for 7days & 28days are 24.7N/mm² & 41.92N/mm² at 30% replacement with coconut shell



GRAPH.3.VARIATION OF COMPRESSIVE STRENGTH USING COCONUT SHELL &COPPER SLAG(CS)

From graph.3. The compressive strength using coconut shell and copper slag, the combination of using coconut shell and copper slag got the highest strength for 7days & 28 days are 24.32N/mm² & 41.7N/mm² at 40%copper slag & 30%coconut shell

CONCLUSIONS

From the experimental investigation the following results are concluded

1. The uncontaminated throw away material coconut shell which is partly restore with coarse aggregate is used effectively for light concrete
2. Coconut shell up to 40% restored by coconut shell is eternal according to strength and evaluate wise
3. It can reduce environmental pollution up to 40% by replacement of coconut shell
4. The maximum value reached for 7days & 28days are 24.7N/mm² & 41.92N/mm² at 30% replacement with coconut shell
5. Using copper slag in place of fine aggregate in concrete it rises the density of concrete
6. Utilizing the percentage of copper slag may improve the compressive strength and also workability differentiate with fine aggregate The extreme value get as far as for 7days & 28 days are 24.09N/mm² & 40.32N/mm² are at 40% replacement with copper sla
7. After many tests results and observations of both the mix it is concluded that the combination of using coconut shell and copper slag got the highest strength for 7days & 28 days are 24.32N/mm² & 41.7N/mm² at 40%copper slag & 30%coconut shell

REFERENCES

[1] Al-Jabri KS, Al-Oraimi SK: "Performance of High Strength Concrete made with Copper Slag as a Fine Aggregate". Section edition published 2009.

[2] Chandraul Kirti , Singh Manindra Kumar , Saxena Anil Kumar , Arora T. R, "Experimental Study of Coconut Shell Concrete," in IJRASET Volume 3 Issue II, February 2015 ISSN: 2321-9653.

[3] Damre Shraddha, Firake Hitali, Dode Pradeep, ShrikantVarpe, "Sustainable Concrete by Partially Replacing Coarse Aggregate Using Coconut Shell," Journal on Today's Ideas – Tomorrow's Technologies, Vol. 2, No. 1, June 2014 pp. 1–14.

[4] Gopal Charan Behera, Ranjan Kumar Behera, "Effect of Coconut Shell Aggregate On Normal Strength Concrete," (IJERT) ISSN: 22780181 Vol. 2 Issue 6, June – 2013.

[5] Kulkarni Parag Pramod, Chavan Prashant Ganpat, Pagar Chetan Bhaskar, "Coconut Shell As Coarse Aggregate In Concrete," ICRTES 2016.

[6] K.Gunasekaran, R. Annadurai, S. Prakash Chandar, S. Anandh, "Study for the relevance of coconut shell aggregate concrete non-pressure pipe," ELSEVIER/ASEJ , 2016.

[7] IS 456: 2000, "Indian Standard, Plane and reinforced concrete - Code of practice", Bureau of Indian Standards, New Delhi. IS 516:1959, "Method of Tests for Strength of concrete", Bureau of Indian Standards, New Delhi, India.

[8] IS 383 -1970, "Specifications for Coarse and Fine Aggregates from Natural Sources for Concrete", Bureau of Indian Standards, New Delhi, India.

[9] IS 516:1959, "Method of Tests for Strength of concrete", Bureau of Indian Standards, New Delhi, India.

[10] IS 12269-1987," Specification for 53 Grade Ordinary Portland Cement", Bureau of Indian Standards, New Delhi, India.
[11] IS 10262 -2009 "IS Method of Mix Design", Bureau of Indian Standards, New Delhi, India.
[12] Lopa M. Shinde, P. L. Naktode, P. P. Saklecha, "A Review on Consumption of Agricultural Waste Material (Coconut Shell) As Aggregate in Design Mix Concrete," ICQUEST2015 0975 – 8887.
[13] M.V. Patil,"Properties and effects of copper slag in concrete", Vol. 2, Issue-2, April. 2015, PP. 46-50.
[14] M.R.Amarnaath, Jaya Pradeep., "A study on effective replacement of fine aggregate using copper slag", Vol. 1, Issue-10, April. 2015, PP. 227-231.
[15] M. Pavan Kumar, Y. Mahesh, "The behaviour of concrete by partial replacement of fine aggregate with copper slag and cement with ggbs" Vol. 12, Issue-3, Jun. 2015, PP. 51-56.
[16] Reddy SS: "Utilization of copper slag as a partial replacement of fine aggregate in concrete". Section edition published 2013.
[17] Tomas U. Ganiron Jr, "Sustainable Management of Waste Coconut Shells as Aggregates in Concrete Mixture," Journal of Engineering Science and Technology Review 6 (5) (2013) 7-14.
[18] T.Subramani, A.Anbuvel, "Experimental Behaviour Of Reinforced Concrete Beams With Coconut Shell As Coarse Aggregate," IJAIEM Volume 5, Issue 5, May 2016 ISSN 2319 – 4847.
[19] Suriya.M, Sneha.M, Mohan kumar. G (2018). "Study on the properties of concrete with demolished wastes and sugarcane bagasse ash". International Journal of research granthalayah (Vol. 6, No. 3, pp.220-227).
[20] Yadav, S. R., & Pathak, S. R. (2009). "Use of recycled concrete aggregate in making concrete–an overview".In 34th Conference on our world in concrete & structures (Vol. 16, pp. 18).