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BEST POSSIBLE REPLACEMENT OF FINE AGGREGATES BY CRUMB RUBBER IN GEO-POLYMER FLY ASH BASED CONCRETE

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Abstract: The use of Portland cement in concrete construction is under critical review due to high amount of carbon dioxide gas released to the atmosphere during the production of cement. In recent years, attempts to increase the utilization of fly ash to partially replace the use of Portland cement in concrete are gathering momentum. Most of this by-product material is currently dumped in landfills, creating a threat to the environment. Geopolymer concrete is a 'new' material that does not need the presence of Portland cement as a binder. Instead, the source of materials such as fly ash, that are rich in Silicon (Si) and Aluminium (Al), are activated by alkaline liquids to produce the binder. Hence concrete with no Portland cement.

Keywords: Cement Replacement, Fly Ash, Mix design

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INTRODUCTION

Geopolymer is used as the binder, instead of cement paste, to produce concrete. The geopolymer paste binds the loose coarse aggregates, fine aggregates and other unreacted materials together to form the geopolymer concrete (Prakash reddy et al 2016). The manufacture of geopolymer concrete is carried out using the usual concrete technology methods. As in the portland cement concrete, the aggregates occupy the largest volume, that is, approximately 75 to 80% by mass, in geopolymer concrete. The silicon and the aluminum in the fly ash are activated by a combination of sodium hydroxide and sodium silicate solutions to form the geopolymer paste that binds the aggregates and other unreacted materials (Prakash reddy et al 2016).

OBJECTIVES

Objectives of optimum replacement of fine aggregate by Crumb Rubber are as follows:-

1. To find optimum replacement of fine aggregate by Crumb Rubber

PROBLEM DEFINITION

According to many research papers the stock of conventional fine aggregates are limited and we continued these fine aggregates, it will be not available after 15-20 years.
So to find economic and similar strength material for replacement of natural fine aggregates.

METHODOLOGY

Step: 1 Defining Study area
Step: 2 Finalization of objective and scope of study
Step: 3 Selection of materials
Step: 4 Based on material and test process, collection of researched papers and patents
Step: 5 literature review
Step: 6 Collection of materials
Step: 7 Mixing
Step: 8 Casting
Step: 9 Testing
Step: 10 Result Analyses

MIX DESIGN

Material	Quantity(For 1 cube)
Fly ash	1.44 kg
Fine aggregate(crumb rubber)	1.70 kg
Coarse aggregate	3.72 kg
NaOH(sodium hydroxide)	0.70 kg
Nasio2(sodium silicate)	1.40 kg

Water	1 liter

(Table : 1)

Experimental Programme

Geopolymer Concrete Cubes having grade M30 were made by fly Ash as a 100% replacement of cement, Alkaline Solution, fine aggregate, crumb rubber and coarse aggregates. Dimensions of moulds were 150 mm X 150mm X 150 mm. After casting, all moulds were cured by different methods natural, Self, Oven cured. Mix proportion of Geopolymer concrete as per table.

Workability Tests

SLUMP TEST:-

To determine the workability of concrete mix by slump test conducted by as per IS 1199-1959. The internal surface of the mould thoroughly cleaned and freed from superfluous moisture than mould placed on a smooth, horizontal, rigid and non-absorbent surface. The mould was filled in four layers, each approximately one-quarter of the height of the mould. Each layer was tamped with twenty-five strokes of the rounded end of the tamping rod. The bottom layer tamped throughout its depth. After the top layer has been rodded, the concrete was struck off level with a trowel or the tamping rod, so that the mould is exactly filled. [12]

The mould removed from the concrete immediately by raising it slowly and carefully in a vertical direction. This allows the concrete to subside and the slump shall be measured immediately by determining the difference between the height of the mould and that of the highest point of the specimen being tested.[12]

Compaction Factor Test:-

The concrete was placed gently in upper hopper, using the hand scoop. The hopper was filled level with its brim and trap door was opened so concrete falls in to lower hopper. Than the trapdoor of second hopper was opened and concrete was allowed to fall in cylinder. The excess concrete above the top of cylinder was removed by towel. The weight of concrete was measured and compare that with the weight of concrete was fully compacted in same cylinder and the ratio of both known as compaction factor. [12]

Test Result

Table – 2 Slump test results

Mix Proportion	Slump(mm)
M0	118
M1	107
M2	91
M3	85
M4	71
M5	70

CONCLUSION

Concrete mixes were prepared with control concrete, untreated rubber concrete and vulcanized rubber concrete. For control concrete only one batch of M40 was prepared where as for rubberized concrete different ratios of rubber crumb were used. Various tests were done on the concrete which concluded that, With the increase in rubber content in concrete the workability is decreased substantially due to increased viscosity which results in the increased slump. The strength of concrete was decreased with the increase in rubber content as compared to control concrete but the vulcanized rubber concrete showed better result than untreated rubber when tested for compressive strength with 5% replacement by fine aggregate, the untreated rubber concrete showed about 30% decrease in compressive strength where as the vulcanized rubber showed only 22% decrease as compared to control concrete. The flexure strength of rubberized concrete was same or little lower than control concrete at 5% replacement of rubber, on increasing the percentage of rubber the flexural strength decreased. The bond property was observed to be improved. During flexure test and split tensile test it was observed that the pieces of concrete tend to stay together which were linked by the rubber crumb which means the rubberized concrete possess increased toughness than normal concrete. The control concrete showed brittle failure but the rubberized concrete showed ductile behavior and took more time for failure.

REFERENCES

1. Sameer Ul Bashir M.Tech (Structural Engineering)National Institute of Technology, Hazratba Srinagar EFFECT OF ALKALI MATERIALS ON GEOPOLYMER CONCRETE IJCIET (Volume 6, Issue 1, January (2015), pp. 01- 13,Page no :1)

2. Khalid Bashir (Civil Department, Bharat University, India) ,Fly Ash-Based Geo Polymer Concrete IOSR Journal of Mechanical and Civil Engineering(IOSR-JMCE) Page no:1

3. Andi Arham Adam M.Sc(Eng) School of Civil, Environmental and Chemical Engineering RMIT University Melbourne, Australia August 2009.

4. Shanker H Sanni and R B Khadiranaikar, Department of Civil Engg., Basaveshwar Engg. College, Bagalkot, Karnataka

5. Susan Bernal, Ruby, Silvio, Delvasto, Erich, Rodriguez Escuela de Ingeniería de Materiales, Grupo de Materiales Compuestos, CENM, Universidad del Valle. Ciudad Universitaria Meléndez, AA 2188, Cali, Colombia

6. Suresh Thokchom, Dr. Partha Ghosh and Dr. Somnath Ghosh Acid Resistance of Fly ash based Geopolymermortars International Journal of Recent Trends in Engineering, Vol. 1, No. 6, May 2009

7. Darshan S., Nitin V., Santosh P K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE

8. Fenghong Fan Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree

of Master of Science in Civil Engineering in The Department of Civil and Environmental Engineering.
9. Vijai, R. Kumutha, and B. G. Vishnuram IACSIT International Journal of Engineering and Technology, Vol. 6, No. 1, February 2014.
10. Ankush Chakravorty, Raj Khatri, Tejkuvarba, Abhijitsinh Parmar, "EFFECT OF AGGREGATE SIZE AND SILICA FUME ON THE WORKABILITY OF GEOPLOYMER CONCRETE", International Journal of Research in Engineering and Technology, Volume: 03 Issue: 04, Apr-2014
11. Prakash reddy vasipalli, Performance of Alkaline Solutions on Different Grades of Geopolymer Concrete, Published on Dec 9, 2016
12. https://www.slideshare.net/LuvSLife/concrete-its-ingredients-and-products