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Mechanical properties jute fibre concrete by using Admixtures

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Abstract: In this study, cement containing Alccofine-1108, which is finer than cement and gives the concrete structure more strength and longevity, was used. cement with varying amounts of Alccofine-1108 added (0%, 5%, 10%, 15%, and 20%).When it comes to cost and variety of uses, jute is one of the most cheap natural fibres, coming in second only to cotton. Plant substances lignin and cellulose make up the majority of the fibre in jute. Along with kenaf, industrial hemp, flax (linen), ramie, etc., it belongs to the group of fibres known as bast fibres, which are derived from the plant's bast, sometimes known as the "skin." Jute fibre is known in the industry as raw jute. The fibres are 1-4 metres (3-13 feet) long, off-white to brown, and variable in thickness. Jute is referred to as the "golden fibre" because of its golden colour and significant economic value. Different amounts of jute fiber 0%, 0.25 %, 0.50 %, 0.75 %, and 1%—are added. Concrete can be made more weather-resistant at a lower cost by using quartz powder in place of sand. The paper outlines a method for designing a concrete mix that uses quartz powder in place of some of the sand. when sand was substituted with 0%, 25%, 50%, and 75% by weight . To assess the strength characteristics of concrete at ages 7 and 28, compression and split tensile tests were performed.

Key points: Alccofine, Quartz Powder, Jute Fibre, Compressive Strength And Split Tensile Strength.

1. Introduction

Information on Alccofine's Behaviour in Concrete is provided in this paper. Compared to cement, fly ash, silica, and many other cement-based materials produced in India, alccofine is a micro-fine material of particles. Due to its optimised particle size distribution, this material had a special ability to improve the performance of concrete at all stages. The Cement Reacts Chemically With The Water And Other Ingredients To Form A Hard Matrix That Binds All The Materials Together Into A Durable Stone-Like Material That Has Many Uses. With a particle size much smaller than other hydraulic materials like cement, fly ash, silica, etc., alccofine is a new generation of micro-fine material that is produced in India.

The most prevalent silica mineral is quartz. Pure quartz is transparent and colourless. Most igneous rocks as well as virtually all metamorphic and sedimentary rocks contain it. Silica is the primary component of quartz. Its secret ingredient is SiO2. It rates a 7 on the Mohs scale for hardness. It Has A High Resistance To Weathering, Both Chemical And Mechanical. Quartz Is Common, Abundant, And Durable.

These fibres can be used to prevent concrete from becoming brittle because India is one of the world's major producers of jute. Jute is second only to cotton in terms of production volume and is one of the most inexpensive natural fibres. In this article, an effort is made to determine the ideal proportion of jute fibres to use with concrete in order to achieve the highest compressive strength. Different fibre contents were used as reinforcement, aiming to achieve uniform distribution and random orientation across the matrix. Axial compression tests on specimens with various fibre contents were conducted.

2.Objectives

1. To Maximise The Percentage Of Alccofine 1108 Partial Replacement With Cement.

2. Contrast The Strength Characteristics Of Concrete With Quartz Poeder Partially Rep;Acing Sand With Those Of Conventional Concrete Mix M20.

3. To Use Jute Fibres To Fill The Cracks.

3. Materials

3.1 Cement: In most cases, cement is employed as a binder in concrete, a material that is utilised in building that sets and hardens to connect other components. Construction uses grade 53 OPC (ordinary Portland cement).

3.2 Fine Aggregate: Concrete needs fine aggregate, which can be produced of crushed stone or natural sand. The fine aggregate density quality has a significant impact on the hardened properties of the concrete.

3.3 Coarse Aggregate: The term "coarse aggregate" refers to the material that is retained above the IS Sieve 4.75 mm. According to IS383:1970, the normal maximum size gradually ranges from 10 to 20 mm.

3.4 Water: The Potable Water That Is Used To Make Concrete.

3.5 Alccofine -1108: The particle size of Alccofine 1108, a new generation micro-fine material, is substantially smaller than that of cement, fly ash, and other comparable materials. In this experiment, Ambuja Cements Ltd.'s mineral ingredient Alccofine was used. In place of silica fume, Alccofine 1108 is a substitute cementitious material that can be used in high-performance concrete. It is constructed using supplies utilised in the iron ore industry. Alumina and silica make up a larger portion of the chemical makeup of aluminafine. Concrete can function more effectively in both the fresh and hardened states thanks to certain characteristics of it. It can be used as a good substitute for silica fume. Concrete of all ages has increased strength and durability thanks to the use of Alccofine 1108 as a cement alternative.

3.6 Quartz Powder: It is more durable than most other natural materials. It makes for a great abrasive substance. In addition to being used for sanding and blasting, it is also a component of scouring cleaners. Quartz has a low thermal conductivity, is chemically inert, and low electrical conductivity.

3.7 Jute Fibre: Jute is second only to cotton in terms of production volume and number of applications as one of the most cost-effective natural fibres. Cellulose and lignin are the two main components of plant origin that make up jute fibres. Along with kenaf, industrial hemp, flax (linen), ramie, etc., jute fibre is a type of bast fibre (fibre derived from the plant's bast, sometimes known as the "skin"). Jute fibre is referred to as raw jute in the industry. The fibres are 3 to 13 feet long and range in colour from off-white to brown. Because of its golden colour and high monetary worth, jute is sometimes known as the "golden fibre".

4. EXPREMENTAL RESULT:

4.1 COMPRESSIVE STRENGTH:

The resistance to failure when subjected to compressive forces is known as compressive strength.
Samples measuring 150mmX150mmX150mm are utilised for cube tests. These samples are put through compression testing after 7 and 28 days of cure.

Table 1:Compressive strength result on concrete by Quartz powder as partial replacement of fine aggregate.

Sl.no	% of Quartz Powder	7 Days	28 Days
1	0 %	19.49	27.64
2	25 %	20.29	29.41
3	50 %	21.25	30.62
4	75 %	19.99	28.93

Table 2:Compressive strength result on concrete by Alccofine as partial replacement of cement.

Sl.no	% of Alccofine	7 Days	28 Days
1	0%	19.49	27.64
2	5%	22.54	32.39
3	10%	23.62	34.06
4	15%	27.39	39.58
5	20 %	25.92	37.25

Table 3: Compressive strength result by addition of Jute fibre in concrete.

Sl.no	% of Jute Fibre	7 Days	28 Days
1	0%	19.49	27.64
2	0.25%	23.71	33.92
3	0.5%	23.84	34.56
4	0.75%	22.92	33.72
5	1%	22.71	32.98

Table 4: Compressive strength of concrete for combined partial replacement of fine aggregate by 50% Quartz Powder+ cement by 15% Alccofine and addition of 0.5% of Jute fibre.

S.No	AF+QP+JF	Compressive strength results, N/mm²	
		7 Days	28 Days
1	0%	19.49	27.64
2	15%+50%+0.5%	31.62	44.53

4.2 SPLI TENSILE STRENGTH

Table 5: Split tensile strength result on concrete by Quartz powder as partial replacement of fine aggregate.

Sl.no	% of Quartz Powder	7 Days	28 Days
1	0 %	1.89	2.73
2	25 %	2.03	2.91
3	50 %	2.13	3.05
4	75%	1.98	2.84

Table 6: Split tensile strength result on concrete by Alccofine as partial replacement of cement

Sl.no	% of Alccofine	7 Days	28 Days
1	0%	1.89	2.73
2	5%	2.21	3.18
3	10%	2.32	3.34
4	15%	2.72	3.95
5	20 %	2.54	3.69

Table 7: Split tensile strength result by addition of Jute fibre in concrete

Sl.no	% of Jute Fibre	7 Days	28 Days
1	0%	1.89	2.73
2	0.25%	2.34	3.36
3	0.5%	2.42	3.45
4	0.75%	2.25	3.28
5	1%	2.19	3.19

Table 8: Split tensile strength of concrete for combined partial replacement of fine aggregate by 50% Quartz Powder+ cement by 15% Alccofine and addition of 0.5% of Jute fibre.

S.No	AP+QP+JF	Split Tensile strength results, N/mm²	
		7 Days	28 Days
1	0 %	1.89	2.73
2	15%+50%+0.5%	3.15	4.45

5. CONCLUSION

The concrete's compressive and split tensile strength were evaluated under various conditions. In normal concrete, the compressive strength reached 19.49 N/mm^2 at 7 days and 27.4 N/mm^2 at 28 days, while the split tensile strength was 1.89 N/mm^2 at 7 days and 2.73 N/mm^2 at 28 days. When 15% of the cement was replaced with Alccofine, the compressive strength increased to 27.39 N/mm^2 at 7 days and 39.58 N/mm^2 at 28 days, and the split tensile strength improved to 2.72 N/mm^2 at 7 days and 3.95 N/mm^2 at 28 days. Replacing 50% of the fine aggregate with Quartz powder resulted in a compressive strength of 21.25 N/mm^2 at 7 days and 30.62 N/mm^2 at 28 days and a split tensile strength of 2.13 N/mm^2 at 7 days and 3.05 N/mm^2 at 28 days. Additionally, the addition of 0.5% jute fiber increased the compressive strength to 23.84 N/mm^2 at 7 days and 34.56 N/mm^2 at 28 days, along with a split tensile strength of 2.42 N/mm^2 at 7 days and 3.45 N/mm^2 at 28 days. Combining a 15% Alccofine replacement, 50% Quartz powder replacement, and 0.5% jute fiber addition yielded a compressive strength of 31.62 N/mm^2 at 7 days and 44.53 N/mm^2 at 28 days, as well as a split tensile strength of 3.15 N/mm^2 at 7 days and 4.45 N/mm^2 at 28 days.

6. References

1. S Tiwari1 , A K Sahu2 and R P Pathak3.Mechanical Properties and Durability Study of Jute Fiber Reinforced Concrete,IOP Conf. Series: Materials Science and Engineering 961.

2. Dayananda N , KeerthiGowda B S and G L Easwara Prasad.A Study on Compressive Strength Attributes of Jute Fiber Reinforced Cement Concrete Composites, IOP Conf. Series: Materials Science and Engineering 376.

3. Dr. K.Chandramouli, J.Sree Naga Chaitanya,Dr.N.Pannirselvam,Dr D Vijaya Kumar, Pathan Arif Khan. STRENGTH STUDIES ON JUTE FIBRE CONCRETE WITH ADMIXTURES ALCCOFINE AND METAKAOLIN WITH M30 GRADE OF CONCRETE, International Journal of Creative Research Thoughts , 10(7),(2022),f26-f29.

4. .Mr. Solomon Ikechukwu Anowai, Prof. Olorunmeye Fredrick Job, "Durability Properties of Banana Fibre Reinforced Fly Ash Concrete", International Research Journal of Engineering and Technology, 4 (11), Nov -2017, e-ISSN: 2395- 0056, p-ISSN: 2395-0072

5. Chakraborty S, Kundu P S, Roy A, Basak K R, Adkhikari B, and Majumder S B 2013 Constr. Build. Mater. 38 776-784.

6. Mahim Mathur, Mahim Mathur,. Performance of Concrete by Partial Replacement of Alccofine -1203,International Journal of Engineering Research & Technology, 2018.

7. Siddharth P. Upadhyay and M. A. Jamnu "Effect on Compressive strength of High Performance Concrete Incorporating Alccofine and Fly Ash" International Journal Of Innovative Research & Development, ISSN 2278-0211, volume 3, issue 2 ppt on 24 February 2014.

8. B. Alekhya, Dr. K. Chandramouli, J. Sree Naga Chaitanya, Dr. N. Pannirselvam. International Journal of Science, Engineering and Technology, 2021,9:5.

9.Chandramouli K, "Chloride Penetration Studies on Concretes Modified with AR-Glass Fibres", ispublished in American Journal of Engineering and Applied Science. 7 (3): 371-375, 2010 (ISSN 1546-9239) 2010 Science Publications.

10. Pannirselvam N, Chandramouli K, Anitha V, "Experimental Investigation on Special Concrete using Steel Nail" is published in International Journal of Recent Technology and Engineering (IJRTE); ISSN: 2277-3878, Volume-7, Issue- 6S; March 2019.