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Strengthening on jute fibre concrete by using Quartz powder as partial replacement of fine aggregate and Alcoffine ad partial replacement of cement.

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Abstract: In this exploration, cement with alccofine- 1108 which is finer than cement which provides advanced strength and continuity to the concrete structure. Cement with alccofine- 1108 added in different percentages of 0, 5, 10, 15 and 20.jute is one of the most affordable natural fibre, and alternate only to cotton . The industrial term for jute fibre is raw jute. The fibres are off- white to brown, and 1 – 4 measures(3 – 13 bases) long. Jute is also called the golden fibre for its color and high cash value. Jute fibre is added in different percentages of 0,0.25,0.5,0.75 . The paper presents a concrete mix design procedure for partial relief of sand with quartz powderreplaced with 0, 25, 50 and 75 of quartz powder the strength of concrete at the age of 28,56 and 90 days.

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

1. Introduction

This Paper Gives Information About The Behaviour Of Alccofine In Concrete. Alccofine Is The Micro Fine Material Of Particles Finer Than That Of Cement, Fly Ash, Silica And Many Other Cement-Based Materials Which Are Producing In India. This Material Had A Unique Character To Enhance The Performance Of Concrete In All The Stages Because Of Its Optimized Particle Size Distribution.
The Cement Reacts Chemically With The Water And Other Ingredients To Form A Hard Matrix Which Binds All The Materials Together Into A Durable Stone-Like Material That Has Many Uses. Alccofine Is A New Generation, Micro Fine Material Of Particle Size Much Finer Than Other Hydraulic Materials Like Cement, Fly Ash, Silica Etc. Being Manufactured In India.

The most common mineral containing silica is quartz. Colourless and transparent describe pure quartz. It is present in virtually all metamorphic and sedimentary rocks, as well as the majority of igneous rocks. Silica constitutes a large portion of quartz. It's Sio2 in formula form. According to the Mohs scale, it is 7 out of 10. It Is Highly Resistant To Weathering, Both Mechanical And Chemical. This durability makes it the dominant mineral of mountaintops and the main component of beach, river, and desert sand. It's easy to find, abundant, and durable to use quartz.

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 powder partially replacing sand with those of conventional concrete mix M20.

3. To Fill Cracks With Jute Fibres.

3. Materials

3.1 Cement

A binder, also known as a chemical that sets, hardens, and attaches to other materials to bind them together, is a cement. Cement is typically used to bind sand and gravel (aggregate) rather than on its own. Concrete is made by mixing cement with sand, gravel, and fine aggregate to create mortar for brickwork. The most utilised substance in existence and the second most utilised resource on Earth is concrete.

3.2 Course aggregate:

Concrete is made with coarse aggregates, which are granular and uneven materials like sand, gravel, or crushed stone. Coarse is typically found in nature and can be obtained by blasting quarries or crushing them manually or with crushers.

3.3 Fine aggregate:

The majority of the particles in fine aggregates typically pass through a 3/8-inch filter and are often made of natural sand or crushed stone. Any particle larger than 0.19 inches is considered a coarse aggregate, which typically has a diameter between 3/8 and 1.5 inches.

3.4 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. 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.

3.5 Quartz Powder:

It is tougher than the majority of other natural materials. As a result, it makes a great abrasive material. It is a component of scouring cleaners and is used for sandblasting and sanding as well. Quartz is chemically inert and has a low electrical and thermal conductivity.

3.6 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 Alccofine as partial replacement of cement

Sl.no	% of Alccofine	28 Days	56 Days	90 Days
1	0%	27.64	30.12	32.28
2	5%	32.39	35.24	37.93
3	10%	34.06	37.08	39.81
4	15%	39.58	43.14	46.31
5	20 %	37.25	40.59	43.57

Table 2: Compressive strength result on concrete by Quartz powder as partial replacement of cement

Sl.no	% of Quartz Powder	28 Days	56 Days	90 Days
1	0 %	27.64	30.12	32.28
2	25 %	29.41	32.06	34.49
3	50 %	30.62	33.37	35.82
4	75 %	28.93	31.48	33.81

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

Sl.no	% of Jute Fibre	28 Days	56 Days	90 Days
1	0%	27.64	30.12	32.28
2	0.25%	33.92	36.97	39.68
3	0.5%	34.56	37.82	40.43
4	0.75%	33.72	36.69	39.25
5	1%	32.98	35.94	38.54

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

S.No	AF+QP+JF	Compressive strength results, N/mm²		
		28 Days	56 Days	90 Days
1	0%	27.64	30.12	32.28
2	15%+50%+0.5%	44.53	48.82	52.09

4.2 SPLI TENSILE STRENGTH

Table 5: Split tensile strength result on concrete by Alccofine as partial replacement of cement

Sl.no	% of Alccofine	28 Days	56 Days	90 Days
1	0%	2.73	2.97	3.19
2	5%	3.18	3.46	3.72
3	10%	3.34	3.64	3.95
4	15%	3.95	4.31	4.62
5	20 %	3.69	4.02	4.31

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

Sl.no	% of Quartz Powder	28 Days	56 Days	90 Days
1	0 %	2.73	2.97	3.19
2	25 %	2.91	3.15	3.41
3	50 %	3.05	3.32	3.56
4	75	2.84	3.09	3.34

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

Sl.no	% of Jute Fibre	28 Days	56 Days	90 Days
1	0%	2.73	2.97	3.19
2	0.25%	3.36	3.68	3.93
3	0.5%	3.45	3.76	4.03
4	0.75%	3.28	3.57	3.84
5	1%	3.19	3.49	3.72

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

S.No	AP+QP+JF	Split Tensile strength results, N/mm²		
		28 Days	56 Days	90 Days
1	0 %	2.73	2.97	3.19
2	15%+50%+0.5%	4.45	4.85	5.46

5. CONCLUSION

The compressive strength results for concrete samples at 28, 56, and 90 days were as follows: normal concrete achieved strengths of 27.64 N/mm^2, 30.12 N/mm^2, and 32.28 N/mm^2, respectively. When 15% of the cement was replaced by Alccofine, the compressive strength increased significantly to 39.58 N/mm^2 at 28 days, 43.14 N/mm^2 at 56 days, and 46.31 N/mm^2 at 90

days. Conversely, replacing 50% of the fine aggregate with Quartz powder resulted in compressive strengths of 30.62 N/mm^2 at 28 days, 33.37 N/mm^2 at 56 days, and 35.82 N/mm^2 at 90 days. Furthermore, the addition of 0.5% jute fiber to the concrete contributed to compressive strengths of 34.56 N/mm^2 at 28 days, 37.82 N/mm^2 at 56 days, and 40.43 N/mm^2 at 90 days. The combined effect of replacements, including 15% Alccofine, 50% Quartz powder, and 0.5% jute fiber, resulted in substantial compressive strengths of 44.53 N/mm^2 at 28 days, 48.82 N/mm^2 at 56 days, and 52.09 N/mm^2 at 90 days. Similarly, for split tensile strength, the values for normal concrete at 28, 56, and 90 days were 2.73 N/mm^2, 2.97 N/mm^2, and 3.19 N/mm^2, respectively. With the replacement of 15% cement by Alccofine, the split tensile strength improved to 3.95 N/mm^2 at 28 days, 4.31 N/mm^2 at 56 days, and 4.62 N/mm^2 at 90 days. Replacing 50% of the fine aggregate with Quartz powder yielded split tensile strengths of 3.05 N/mm^2 at 28 days, 3.32 N/mm^2 at 56 days, and 3.56 N/mm^2 at 90 days. Additionally, the introduction of 0.5% jute fiber resulted in split tensile strengths of 3.45 N/mm^2 at 28 days, 3.76 N/mm^2 at 56 days, and 4.03 N/mm^2 at 90 days. The combined replacement of 15% Alccofine, 50% Quartz powder, and 0.5% jute fiber enhanced split tensile strengths to 4.45 N/mm^2 at 28 days, 4.85 N/mm^2 at 56 days, and 5.46 N/mm^2 at 90 days.

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