Evaluation of properties of concrete using Nano Silica and coconut Fibre

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ABSTRACT

Concrete is the most significant structure materials exceptionally utilized in structural building for development. Portland concrete is perhaps the biggest expended in universe. For better understandings and exact designing of an exceptionally intricate structure made of good bonding properties at the Nano-level. One of the approaches to improve the pressing is to build the strong size range, for example by including particles with sizes underneath 300 nm. Potential materials which are as of now accessible are silica fines like silica rage (SF) and limestone and nanosilica (nS). Expansion of nS and coconut fiber into solid prompts an expansion of both. The properties in new state (stream properties and usefulness) are administered by the molecule size dissemination, however the properties of the solid in solidified state, for example, toughness and quality, are exceptionally influenced by the blend reviewing and coming about molecule pressing.

Figure: Nano Silica

Figure: Coconut Fibre

MATERIALS AND METHODOLOGY

The materials required for this project are as follow

Ordinary Portland Cement (OPC 43)

Nano Silica

Coconut

Fiber

Tests for Ordinary Portland Cement OPC

Standard Consistency: The standard consistency test used find out the content of water. Following are the results of test using various percentages of water.

Table: Standard consistency

Percentage of Water	28%	31%
Initial Reading (mm)	5 mm	5 mm
Final Reading (mm)	27 mm	6 mm
Height not penetrated (mm)	32 mm	11 mm

SIEVE ANALYSIS OF COARSE AGGREGATES

The aggregated used were graded having size of 20 mm were used (IS:2386 Part-1)

Table: Sieve analysis

Size of sieves in mm	Wt. Retain (Kg)	Percentage of wt. Retain	Cum wt. Retain	% age Finer
80	0	0	0	0
63	0	0	0	0
50	0	0	0	0
40	0	0	0	0
25	0	0	0	0
20	0.11	11	11	89
16	4.1	410	421	321
12.5	0.68	68	489	389
10	0.05	5	494	394
6.3	0.03	3	497	397
4.75	0.00	0.1	497.1	397.1
Pan	0	0	497.1	397.1

SIEVE ANALYSIS OF FINE AGGREGATES

Weight of sand was taken as 1 Kg.

Fine Aggregates grading (IS:383-1970)

Table: Result of fine aggregate sample

Size of sieves in mm	Wt. Retained (in gram)	Wt. Passed
4.75mm	17 gm	983
2.36mm	110 gm	873
1.18mm	509.5 gm	363.5

0.6mm	190.5 gm	173
0.3mm	126 gm	47
0.15mm	22.5 gm	24.5
Pan	0.5	24

SPECIFIC GRAVITY OF CEMENT

Sp. gravity of cement is found using Le. Chatliers apparatus.

Table: Specific gravity of cement

Empty flask weight	Flask weight + cement	Flask + cement + weight	Flask + diesel
104 gm	154 gm	364.5 gm	333 gm

During the test Sp. gravity of OPC has been found as 3.156

SPECIFIC GRAVITY OF SAND

Weight of the sand was taken as 500 gm

Table: Sp. Gravity test results

Empty picnometer	Sand + picnometer	Water + sand + picnometer	Water + picnometer
610 gm	1110 gm	1820 gm	1507 gm

During the test Sp. Gravity of sand has been found as 2.53

The result of Sp. Gravity of coarse aggregates are as follows:

Table: Sp. gravity of coarse aggregate

Weight of the empty container	Empty container + coarse aggregates	Container + coarse aggregates + water	Water + Container
84 gm	584 gm	1621 gm	1295 gm

Specific Gravity (coarse aggregate) = 2.87

Compressive strength test (CTM)

The compressive strength of the material is the capacity to withstand loads tending to reduce size.

Test Procedure – A standard concrete cube specimen placed in CTM. Uniformly increasing compression load will be applied to the specimen until the specimen fails after the generation of cracks. The compression load at which the specimen starts to deform is noted down as the compressive strength of the material.

Initial and Final Setting Time

Table: Initial and Final Setting Time

Initial Setting Time	45 Mins
Final Setting Time	530 Mins

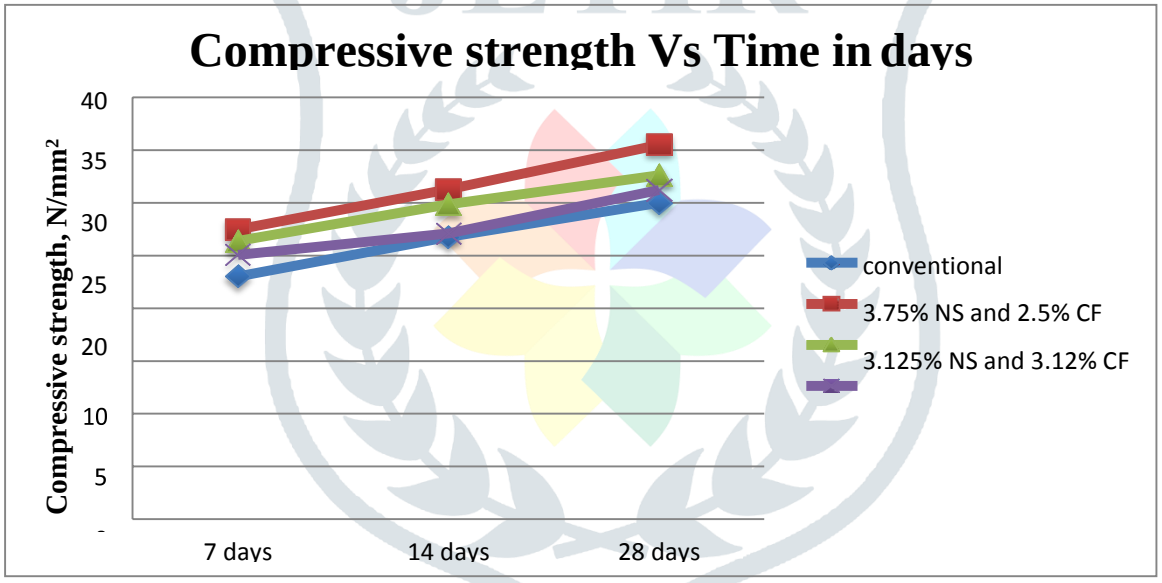
RESULTS

To check the workability slump test and compaction test conducted with fresh concrete and cubes, cylinder and beams were casted. The proportion which is used in while test M25 is having ratio of 1:1.34:2.49 with Waster-cement ratio of 0.46. The reading of split tensile strength, compressive strength was taken at regular interval of 7, 14 and 28 days.

Compressive strength test results

Table: compressive strength result

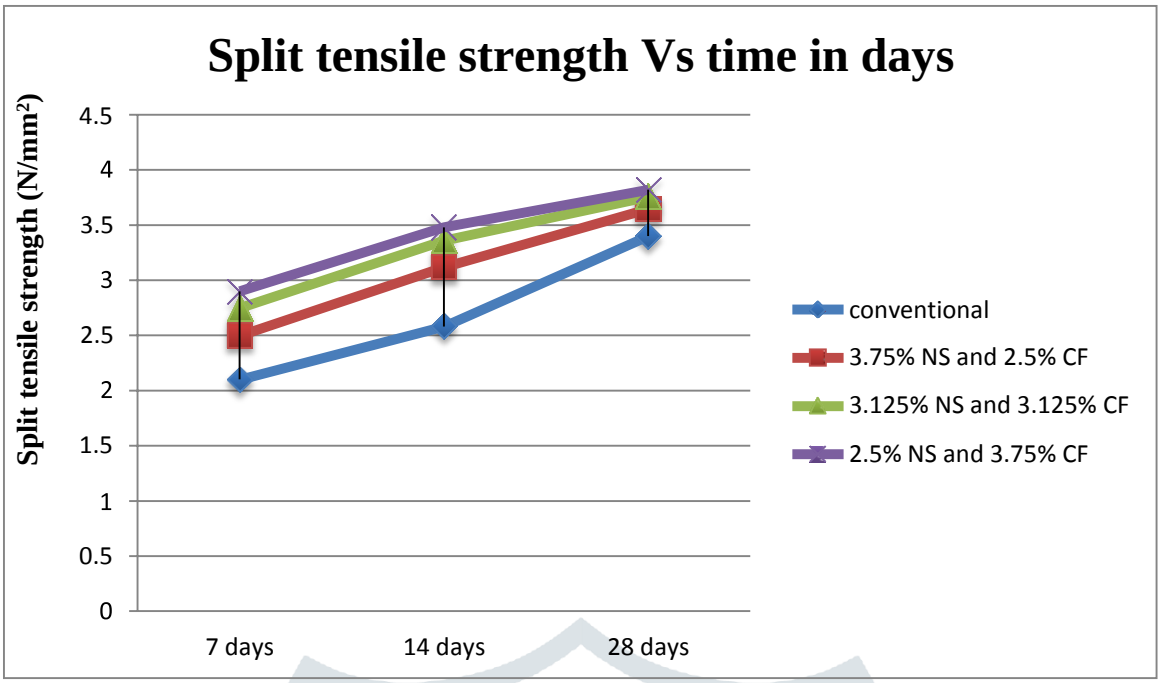
	Seven days	Fourteen days	Twenty-Eight days
Conventional	23.05	26.78	30.02
3.75% NS and 2.5% CF	27.52	31.29	35.51
3.125% NS and 3.12% CF	26.41	29.87	32.63
2.5% NS and 3.75% CF	25.09	27.13	31.22



Split tensile strength results

Table: Split Tensile results

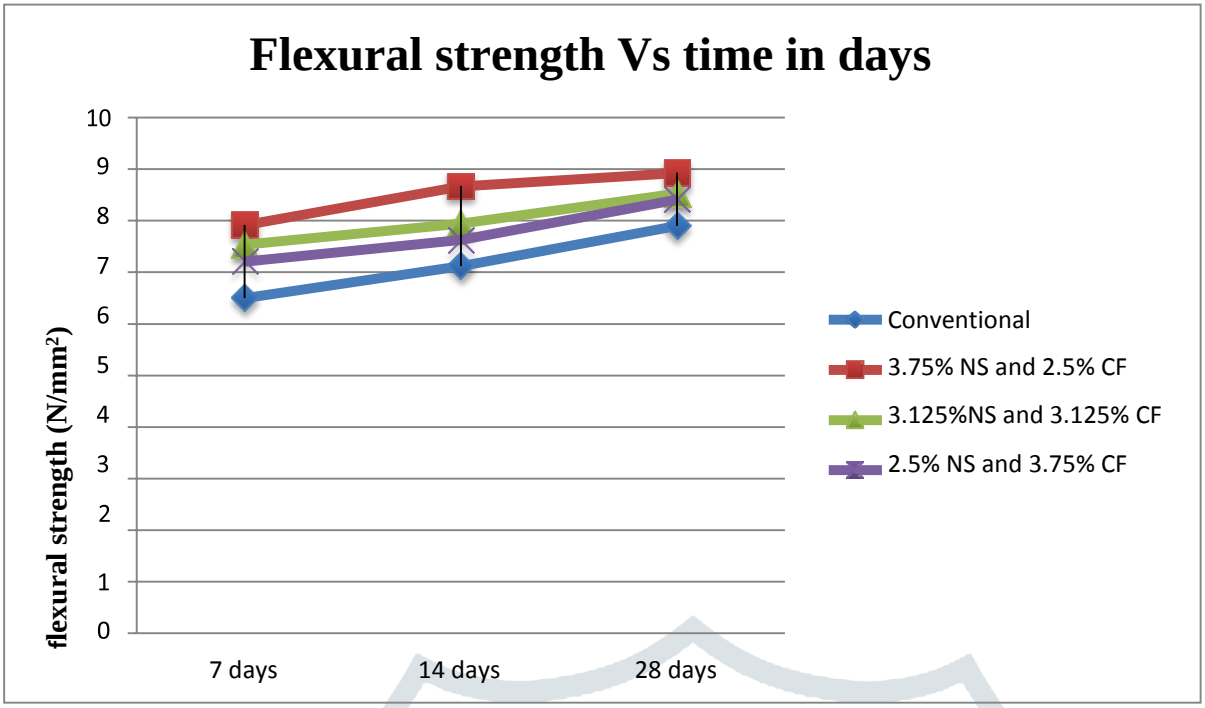
Split tensile test (N/mm²)			
	Seven days	**Fourteen days**	**Twenty-Eight days**
Conventional	2.10	2.58	3.4
3.75% NS and 2.5% CF	2.5	3.12	3.65
3.125% NS and 3.125% CF	2.75	3.36	3.76
2.5% NS and 3.75% CF	2.9	3.48	3.82



Beam flexural strength results

Table: Beam flexural result

	Beam flexural strength (N/mm²)		
	Seven days	**Fourteen days**	**Twenty-Eight days**
Conventional	6.5	7.12	7.90
3.75% NS and 2.5% CF	7.92	8.67	8.93
3.125%NS and 3.125% CF	7.54	7.95	8.53
2.5% NS and 3.75% CF	7.21	7.63	8.41



CONCLUSION

Nano Silica increases the overall strength but specially the compressive and beam flexural strength.

Coconut Fibre increases specially the split tensile strength.

Combination of Nano Silica and Coconut Fibre increases the overall strength

Uses of these materials in Civil Engineering leads to sustainable development and green environment.

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