AN EXPERIMENTAL INVESTIGATION ON CONCRETE WITH PARTIAL REPLACEMENT OF FINE AGGREGATE BY USING SINICON PP WITH POLYPROPYLENE FIBER

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Abstract
In this project deals with the experimental investigation on concrete with replacement of fine aggregate by using sinicon (pp). Additionally we add the polypropylene fiber for increasing the strength of concrete because fiber reinforced concrete is one of the most advancement which offers a convenient practical and economical method for controlling micro cracks and similar type problems. Replacing the sinicon (pp) with fine aggregate 0% , 10% , 20% , 30% , 40% & 50% in trial mixed Then we are making a cube as size (150mm x 150mm x 150mm) as above percentage in 7, 14, &28 days. The polypropylene fiber is added with 0.8% in M40 Grade of concrete. Hence we expect to reach the target strength. This material will control the emission of greenhouses gases and thereby control the climate changes.
Keywords: Siniconpp, Polypropylene Fiber, Compressive strength,Cracks, Climate changer

1. INTRODUCTION

Concrete is a structural masonry material made by mixing broken stone or gravel with sand, cement, and water and allowing the mixture to harden into a solid mass. The cement is the chemically active element, or matrix; the sand and stone are the inert elements, or aggregate. Concrete is adaptable to widely varied structural needs, is available practically anywhere, is fire resistant. Addition to this the natural materials are added with concrete to increase their strength and stiffness.

1.1 OBJECTIVE

The scope of the investigation can be summarized as follows

- To study the effect on workability with varying percentage of Sinicon PP adding in concrete.
- To find out the optimum percentage of Sinicon PP by adding in concrete.
- To study the mechanical properties of concrete such as compressive strength, split tensile strength and flexural strength.

1.2SCOPE OF OUR PROJECT

The main objective of this investigation is to study the possibility of adding Sinicon PP in concrete. In view of this, trial mixes have been made in the present work by adding 0%, 10%, 20%, 30%, 40% and 50 % of Sinicon PP to the mass of concrete.

- Global warming is controlled by the process of reducing greenhouse gases like CO2, HFC and Sulphur di oxide in atmosphere.
- Sinicon PP is good agent to absorb harmful gases.
- makes living comfortable. Makes building fire proof and heat resistant.
- No more spalling of plaster and concrete.It is an eco-friendly structure.
- In additionally we add polypropylene fiber as admixture used to increase the strength of the concrete .
- The water permeability of siniconpp very low and thus structure could not absorb moisture from the atmosphere.
- Development of corrosion in the reinforcement can be substantially reduced and that extendsthe RCC structure life.

1.3METHODOLOGY

- Collection ofLiterature And Study
- Collection ofMaterials And Study
- Test On Material Study & Properties
- Mix Design M-40 Grade Of Concrete
- Testing Of Fresh Concrete
- Casting Of Specimens
- Curing Of Specimens
- Testing Of Hardened Concrete
- Result And Discussions
- Conclusion

2. MATERIAL PROPERTIES

2.1 MATERIAL UESD

a) Cement (OPC 53)
b) Coarse Aggregate
c) Fine Aggregate
d) Polypropylene fiber
e) Mixing of water

2.1.2 Cement

OPC53 Grade conforming IS12269:1987, Minimum cement content: 320 kg/m3 (IS456:2000)

Table 1 Physical Properties of Cement

S.No	Test for cement	Apparatus	Result	Limitation
1.	Standard Consistency Test	Vicat Apparatus	5.7 mm	5 – 7 mm
2.	Initial setting time	Vicat Apparatus	35mins	30 mins
3.	Final setting time	Vicat Apparatus	580 mins	600 mins
4.	Specific gravity	Pycnometer	3.11	3.11

2.1.3 Coarse Aggregate

As per IS 383:1970 the 20mm used. The shape of coarse aggregate is angular

Table 2 Physical Properties of Coarse aggregate

S.No	Test for coarse aggregate	Apparatus	Result	Limitation
1	Water Absorption	-	0.5%	1%
2	Specific Gravity	Pycnometer	2.87	2.6 - 2.9
3	Fineness Modulus	Sieves	6.65	6.0 - 6.9
4	Impact value	Impact testing machine	20%	45%

2.1.4 Fine Aggregate

As per IS 383:1970 fine aggregate properties were tested.

Table 3 Physical Properties of Fine aggregate

S.no	Test for fine aggregate	Apparatus	Result	Limitation
1.	Fineness Modulus	Sieves	2.8(Zone III)	2.9 – 3.2
2.	Specific Gravity	Pycnometer	2.56	2.6 -2.8
3.	Water absorption	-	0.35%	2%

Sinicon PP

It is a unique volcanic glass, a large deposit of which is found at only one location on the earth which is South Africa. Sinicon PP is made out of feed from this mines using patented manufacturing process to convert this volcanic glass into well-sealed tough glass granules which is ideally suited for use with cementitious and other binders.

Under the microscope, each tough granule comprises a froth of glass-walled closed cells each enclosing a near vacuum. Sinicon PP is therefore best described as comprising millions of tiny sealed "thermos flasks", making it an absolutely unique and unrivalled insulating and fire proofing material.

Fig 1 Sinicon PP

Table 4Physical Properties of Sinicon PP

S.No	Test for Sinicon PP	Apparatus	Result
1.	Fineness Modulus	Sieves	0.59
2.	Specific Gravity	Pycnometer	0.27
3.	Water absorption	-	9.86%

2.1.5 Polypropylene Fiber

As per IS 383:1970 fine aggregate properties were tested.Polypropylene is a 100% Synthetic textile fiber it is formed by about 85% Propylene the monomer of polypropylene is propylene. It is cheap in price then polyster it is used as the alternatives of plastic this polypropylene is harmful for the environment. It is not degraded with soil, so it causes harm to the soil. Also it is not decomposed by water for this reason it used as the rope of ship.

Polypropylene fiber used as a concrete additive to increase strength and reduce cracking and spalling, in some areas susceptible to earthquake.

Table 5 Physical properties of Polypropylene Fiber

S.no	Physical properties	Value
1	**Tenacity**	3.5-8.0 gm/den
2	**Density**	0.91 gm/c.c
3	**Elangation at break**	10-45%
4	**Elasticity**	very good
5	**Moisture regain (MR%)**	0%
6	**Melting point**	170 C
7	**Ability to protest friction**	Excellent
8	**Colour**	White
9	**Ability to protest heat**	Moderate
10	**Lusture**	Bright to light
11	**Resiliency**	Good
12	**Diameter**	33-35 micron
13	**Moisture**	<1%
14	**Water penetration**	Significant Reduction
15	**Thermal shrinkage cracks**	Significant Reduction

Fig 2 Polypropylene Fiber

2.1.6 Water

According to IS 3025, water to be used for mixing and curing should be free from injurious or deleterious materials. Portable Water is generally considered satisfactory. In the present investigation, available water within the campus is used for both mixing and curing purposes.

3 MIX DESIGN

3.1Concrete mix proportion

The mixes were designated in accordance with IS 10262-2009 mix design method. Based on the results, the mix proportions M35 was designed. Concrete mix with w/c ratio of 0.40 was prepared. The details of mix proportions for $1m^3$ of concrete are given in Table below

Mix proportions for M40 Grade of Concrete (Kg/m^3)

Grade	Cement	FA	CA	Water
Mix 40	493	727	1018	197
	1	1.47	2.06	0.40

3. CASTING OF SPECIMENS

Cubes (150x150x150mm)
Cylinders (150mm diameter,300mm height)
Prism (500,100 and 100mm)

4. TESTING OF SPECIMENS

a) Slump cone test
b) Compressive strength test
c) Split tensile strength test
d) Flexural strength test

5 RESULTS

A) SLUMP CONE TEST

Table 6 Test Results for Slump of concrete

S.No	% of Replacement	Slump in mm
1.	0%	80mm
2.	10%	75mm
3.	20%	70mm
4.	30%	67mm
5.	40%	65mm
6.	50%	60mm

B) COMPRESSIVE STRENGTH TEST

TABLE 7 TEST RESULTS FOR COMPRESSIVE STRENGTH OF CONCRETE

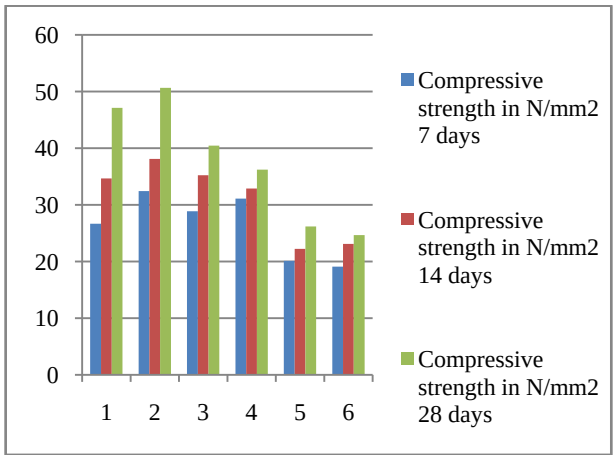

Fig 3 Compressive strength test

C) Split tensile strength test

Table 8 Test results for split tensile strength of concrete

s.no	Percentage of replacement %	Split tensile strength in N/mm2		
		7 days	14 days	28 days
1	0	3.3	3.9	4.5
2	10	3.3	3.7	4.3
3	20	2.8	3.6	4.8
4	30	3.5	3.8	4.25
5	40	2.12	3.1	3.0
6	50	2.9	2.97	2.98

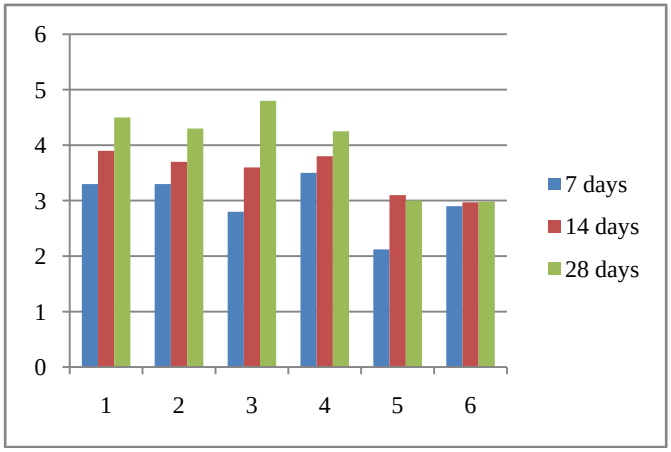

Fig 4 Split tensile strength test

D) FLEXURAL STRENGTH TEST

Table 9 Test results For Flexural strength of concrete

s.no	Percentage of replacement %	Flexural strength in N/mm2		
		7 days	14 days	28 days
1	0	2.2	3.1	3.6
2	10	2.26	2.95	3.32
3	20	2.23	2.9	3.4
4	30	2.7	2.8	3.24
5	40	2.4	2.5	3.2
6	50	2.2	2.1	3

S.No	Percentage of replacement %	Compressive strength in N/mm2		
		7 days	14 days	28 days
1	0	26.66	34.66	47.11
2	10	**32.44**	**38.11**	**50.66**
3	20	28.88	35.22	40.44
4	30	31.11	32.88	36.22
5	40	20.11	22.22	26.2
6	50	19.11	23.11	24.66

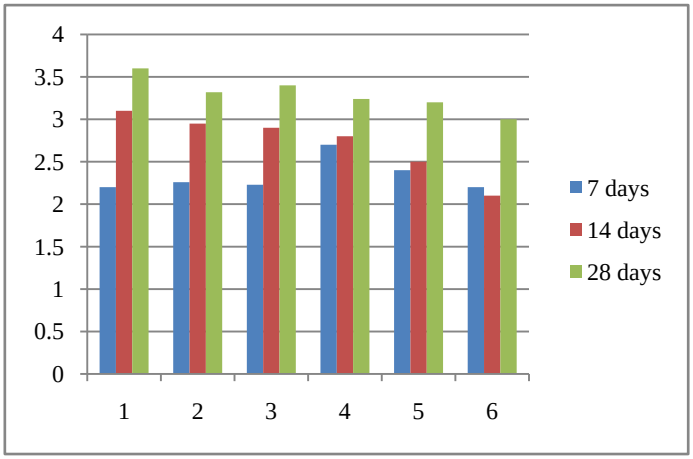

Fig 5 Flexural strength test

CONCLUSION

Here an attempt has been made to investigate the possibility of replacing locally available

artificial material such as Sinicon PP is concrete composites. The Sinicon PP increases the properties of concrete such as impact, compressive strength and tensile strength etc.., The strength of the concrete increase for every 10% of Sinicon PP with Polypropylene Fiber used for M40 grade which is compared with conventional concrete. Based on strength properties it is concluded that optimum is 10% for M40 grade concrete. So finally, it is concluded that Sinicon PP with Polypropylene Fiber of concrete is more effective than conventional concrete.

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