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Research in concrete with partial replacement by Phosphogypsum & Thermosetting plastic instead of cement and fine aggregate

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Abstract - When coaggregates is mixed with cement and water, concrete mixture forms and,that is easy to poured and moulded into different shapes. Also chemical admixtures were using in the mix to satisfy the workability. The usage of cement in the construction segment gets increasing rapidly. Reuse of plastics gives a lot of advantages. Partial replacement at various percentage were examining Because complete replacement of aggregates are not feasible.

Key Words: ***Thermosettingplastic, Phosphogypsum, Strength comparison***

1.INTRODUCTION

Concrete is composed of water, aggregate, and cement. Admixtures and reinforcements included in concrete mix for gain the properties of the finished material. Nowadays big attention is providing on the environment and safe using of natural deposits and recycling of wastes.Plenty of researches are available in the study of waste material.

2. SCOPE

By shortening use of the amount of thermosetting plastic,it will also helps to reduce the buring and pollution of atmosphere.For achieving this, Study and researches regarding this thermosetting plastic will helps to find a proper method of use of them.

A large populated and resourceful land like India is a treasure of the phosphogypsumThe presence of silica,phosphate,fluorine is prohibited the industry to use of this phosphogypsum.

3. EXPERIMENTAL INVESTIGATION

The aim of the project is to do a research in the strength and behavior of thermosetting plastics in concrete. In this research study an optimum amount of phosphogypsum is added to concrete. First part is to find the strength properties of concrete and second is the durability study. This research will doing the experimental program conducted which include material characteristics, mix design, properties of fresh concrete, mechanical properties. In this study six different values of weight fraction of thermosetting plastics are used such as 0%,0.5%,1%,1.5%,2% and 2.5% by replacement of FA. Phosphogypsum is added in a constant percentage (10%) by replacement of cement.

3.1 Constituent materials

1. Cement (53 grade OPC)
2. Phosphogypsum
3. Fine aggregate (M sand)
4. Thermosetting plastics
5. Coarse aggregate
6. Water

3.2 Constituent materials and details

Phosphogypsum is added to a 10% by replacement by cement.

Sl. No	Mixes	Fine aggregate		Binding material	
		Thermosetting plastics weight (%)	M sand (%)	Phosphogypsum (%)	Cement (%)
1	RP0	0	100	0	100
2	RP1	0.5	99.5	10	90
3	RP2	1	99	10	90
4	RP3	1.5	98.5	10	90
5	RP4	2	98	10	90
6	RP5	2.5	97.5	10	90

Table 1

Fig -1: Phosphogypsum(specific gravity-3.2)

Thermosetting plastics are collected in the form of recycled plastics (RP). The plastic is green in color and it poses a size of 2.36 mm.

3.3 Mix design

M25 mix was designed as per IS10262:2009 and the mix proportion was obtained as1.262 : 2.313. Water-cement ratio was 0.4. Other mixes are obtained by replacement of FA by 0.5%,1%,1.5%,2% and 2 .5% . In these mixes cement will replaced with 10% phophogypsum.

Cement – 315g/m3

Fine aggregate –397kg/m3

Coarse aggregate –727kg/m3

Water –126kg/m3

Table 2

Sl. No	Specimen	Property	Size	Numbers
1	Cube	Compressive strength	150x150x150mm	54
2	Cylinder	Split tensile strength	300mm ht and 150mm dia	18
3	Beam	Flexural strength	500x100x100mm	18
Total number of specimens				90

3.4 Specimen details

4. RESULTS

4.1 Results on fresh concrete

Sl.No.	Mix designation	Workability	
		Slump (mm)	Compacting factor
1	RP0	26	0.80
2	RP1	28	0.83
3	RP2	30	0.86
4	RP3	33	0.89
5	RP4	37	0.90
6	RP5	38	0.94

Table 3

Workability of concrete mixes

4.2 Results on hardened concrete

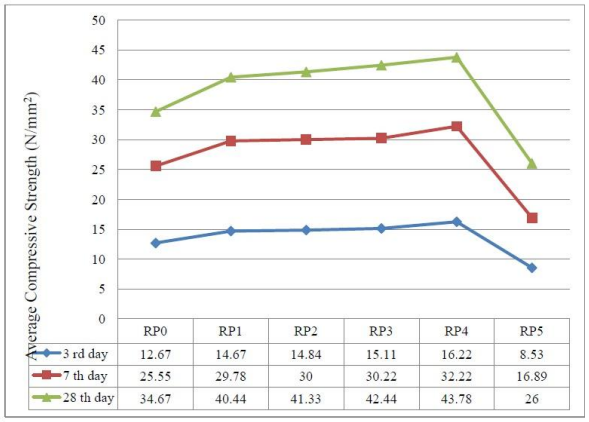

Fig 2

Variation of compressive strength

Sl. No	Mix designation	Average compressive strength (N/mm²)		
		3rd day	7th day	28th day
1	RP0	11.67	24.55	35.67
2	RP1	14.27	29.18	40.424
3	RP2	14.84	30	41.33
4	RP3	15.6	30.2	41.44
5	RP4	16.22	32.22	43.78
6	RP5	8.4	16.2	25.00

Table 4

4.3 Splitting tensile strength

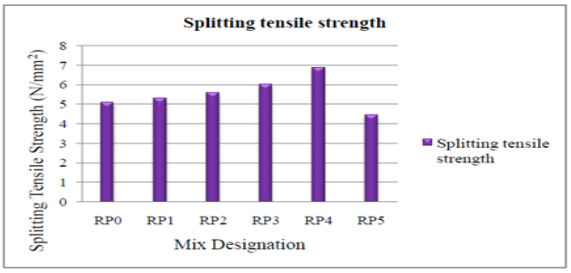

Fig 3
Changes of splitting tensile strength

Sl. No.	Mix designation	Splitting tensile strength (N/mm2)
1	RP0	5.2
2	RP1	5.4
3	RP2	5.6
4	RP3	6.012
5	RP4	6.9
6	RP5	4.5

Table 5
Slitting tensile strength of cylinders

5. CONCLUSIONS

I)Workability increased with increase in thermosetting plastic content and provision of phosphogypsum by replacing with 10% of cement. Maximum workability was obtained at 2.5%.
II)Fine aggregate with 2% replacement (RP4) showed better mechanical properties in the hardened state.
III) Change of 10% constant weight of cement with phosphogypsum. The strength value decreased at RP5.The increase in compressive strength at 28th day of RP4 was about 26.27% than control mix (RP0).
IV)The splitting tensile strength of cylinder was maximum for 2% of replacement (RP4).

REFERENCES

[1] Al-Manaseer A.A, Dalal T.R.(1997) Concrete International, Vol. 1, pp 47-52.
[2] Batayneh et al. (2007) Journal of Waste Management Research ,Vol. 52, pp 1870-1876.
[3] Bayasi Z., Zeng J.(1993) ACI Materials Journal, Vol. 90, pp
[4] 605-610.
[5] Jo B.W., Park S.K., Park J.C.(2007) Vol.23, pp 364-369.
[6] Khatib Z.K. and Bayomy F.M.(1999) "Rubberized Portland cement concrete" Vol. 3, pp 206-213.
[7] Materials Science, Vol. 33, pp 1745–1752
[8] Rupesh Kumar et al (2010) "A study on strength characteristics of phosphogypsum concrete" ACI Materials Journal, Vol. 11, pp 411-420.
[9] Siddique R. and Naik T. R.(2004Waste Management, Vol. 24, pp 563-569.
[10] Soroushian P, Mirza F, Alhozauny Vol. 92, pp 291-295.
[11] Tantala M.W et al (1996) Solid Waste Technology and Management, Vol. 45, pp 97-104.
[12] IS 456:2000, Code of Practice Bureau of Indian Standards, New delhi.