Experimental study of properties of alccofine along with recycled course aggregate in concrete

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***Abstract*—The concrete is worldwide used construction material which will ensures the strength and durability.in the present paper the properties of concrete with alcofine of 5 %, 10%, 15% and Recycled course aggregates of 10%, 15%,20% replacements were used to find the variation in the concrete properties with the comparison of normal concrete.**

***Index Terms*— Recycled course aggregates, Alccofine, Concrete strength.**

I. INTRODUCTION

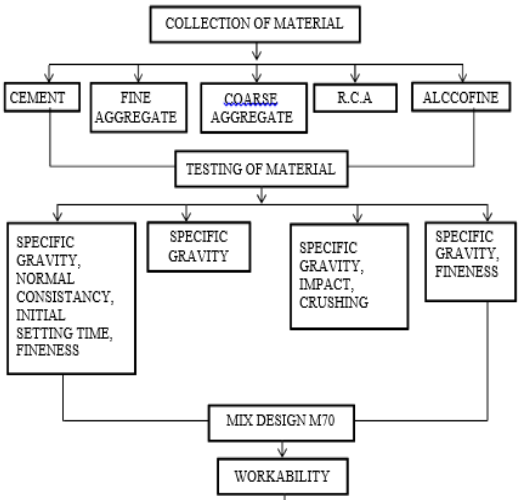
Concrete is most extensively used man made construction material in the world. The manufacturing of cement for concrete produces large amount of carbon dioxide (CO2) emissions into the atmosphere, a major contributor for Global Warming & Greenhouse effect. Therefore it becomes necessary to invent a alternate material for cement to use in construction industry. A lot of Supplementary Cementitious Materials (S.C.M) like silica fumes, fly ash , Alccofine , slag powder etc. have been identified in the past and also have been effectively used as a partial replacement to cement in the production of concrete.

It is also aimed to give a better understanding of the behavior and effect of alccofine- 1203 as an SCM in various types of concretes. The alccofine-1203 has ultra- fine particles with a unique chemical composition that improves the hydration process and Pozzolanic reaction. Therefore, its incorporation in concrete has resulted in good workability, reduction in segregation, reduction in heat of hydration, and reduction in permeability to concrete, and increased the rate of hydration process and improved the Pozzolanic reaction to achieve high strength to concrete at the early curing stage. The presence of calcium (CaO) and silica (SiO2) in alccofine-1203 improved the mechanical and durability properties of concrete better than the other SCMs. Alccofine 1203 and alccofine 1101 are two type of alccofine with low calcium and high calcium silicate respectively. Alccofine 1203 is slag based SCM having ultra-fine with optimized Particle size distribution whereas alccofine 1101 is a micro fine rock anchoring. The performance of alccofine is superior to all the other admixture used in India. Usually alccofine is used in high rise building, bridges, and airport etc.

II. OBJECTIVE OF CURRENT STUDY

- To study the fresh properties of concrete by using alccofine and recycled coarse aggregate.
- To study the compressive strength strength of concrete by using alccofine and recycled coarse aggregate.

III. METHODOLOGY



A. Material Required

Fig. 1 Cement

Fig. 2 Coarse aggregate

Fig. 3 Alccofine

B. Test on Materials

a) Cement

Ordinary Portland cement-43 grade (Ultra tech Cement) available in local market was used in investigation. The cement was tested according to IS 4031: 1988. It confirmed to IS 12269: 1987. Its Properties is given in Table I.

Table 1. Specific Gravity of Cement

SL No.	Properties	Value	As per IS: 12269-1976
1	Specific gravity of cement	2.01	3.15

b) Fine aggregate

Natural and as per IS 383-1987 was used. Locally available river sand is used. The properties of fine aggregate are shown in Table 2.

Table 2. Specific Gravity of FA

SL No.	Property	Result	As per IS:12269-1976
1	Specific gravity	2.09	2.1-3.2

c) Natural Coarse Aggregate:

Natural crushed coarse aggregate confirming to IS code 383-1970 is used. The aggregate size chosen is 20mm and 10mm. The physical properties of natural coarse aggregate are given in Table-3.

d) Recycled Coarse Aggregate

Crushed concrete aggregate waste obtained from the Concrete Testing Laboratory, passing through 25mm and retained on 20mm I.S sieve is used as recycled coarse aggregate in some proportion (5%, 10% and 15% of N.A.). The Physical Properties of recycled Coarse Aggregates are given in Table 3.

Table 3. Specific Gravity of CA

SL. No.	Property	NCA	RCA	As per IS 2386 -1963
1	Max. Aggregate Size	20mm	20mm	
2	Specific Gravity	2.58	2.49	2.5-3

e) Alccofine 1203

ALCCOFINE 1203 is a processed product based on slag of high glass content and low calcium silicate-based mineral with ultrafine particle size. Alccofine used in this study conforms to IRC SP: seventy IS code 456-2000, IS code 12089-1987. The physical properties of ALCCOFINE 1203 are given below in Table-4.

Table 4. Specific Gravity of ALCCOFINE 1203

SL No.	Property	Value	As per IS 12089-1987
1	Aggregate Particle Size	4-6 micron	4.6 Micron
2	Specific Gravity	2.86	2.86

f) Admixture

POLYTANCRETE NGT admixture gives brilliant strength gain at early ages and increases in major strength at all ages by notably decreasing the water demand in a concrete mix .It helps in enhancing the workability and durability of concrete without increasing the water ratio. Specific gravity of admixture is 1.2.

IV. RESULT & DISCUSSION

A. Slump

RCA	SLUMP	ALCCOFINE

		1203
0%	75	20%
5%	73	20%
10%	70	20%
15%	65	20%

B. Compressive Strength

The results of the compressive strength results are presented in the Figure 12. Three cubes are prepared by keeping the alccofine as constant as 20% and RCA is variable as 5%, 10% and 15%. 1 cube of 5% which is tested after 7 days, 14 days and 28 days of after curing.

Table 5. Compressive Strength in Mpa

RCA	ALCCOFINE 1203	7 days	14 days	28 days
0%	20%	16.32	26.14	27.02
5%	20%	16.75	22	31.95
10%	20%	20.76	25.4	32.5
15%	20%	18.67	22.35	28.12

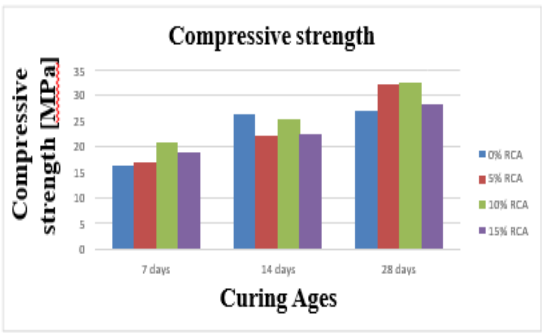


Fig. 4 Compressive Strength in Mpa

The reading is obtained and is presented in the Figure 4. Use of 20% Alccofine & 5% recycle coarse aggregates, giving strengths of 16.75MPa, 22 MPa and 31.95 MPa for 7, 14 and 28 days respectively. Use of 20% Alccofine & 10% of RCA giving strength of 20.76MPa, 25.4MPa & 32.5 MPa for 7, 14 and 28 days respectively. Use of 20% Alccofine & 15% of RCA giving strength of 18.67MPa, 22.35 MPa & 28.12 MPa for 7, 14 and 28 days respectively.

Hence it is proven that the compressive strength is achieved high strength at 10% replacement of RCA as compare to 5 & 15%

V. CONCLUSION

The examination investigates the effect of 20% alccofine on the properties of recycled course aggregate concrete by replacing 5% 10% and 15% natural course aggregate. The outcomes demonstrate that there is an improvement in the compressive strength of concrete because of high pozzolanic nature of the alccofine and its void filling ability. Also there is an increase in flexural strength as compared to a normal concrete. It's use should be promoted for better performance as well as for environmental sustainability it is concluded that mechanical property of recycled course aggregate for 5% 10% and 15% recycled is improved when 20% alcohol is added. It is suggested that 20% alcohine as partial cement replacement in concrete containing recycled course aggregate from construction and demolition waste can produce structural grade concrete that is able to perform without any drawbacks to its Mechanical properties.

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