International Journal of Scientific Research & Engineering Trends
Volume 8, Issue 3, May-Jun-2022, ISSN (Online): 2395-566X

Experimental Study of Strength and Behaviour of Gypsum with Sugarcane Bagasse Ash in Polymer Impregnated Mortar

Anto Moses Mukilan A, Arumugam Essaki S, Akash Aravind S
Department of Civil Engineering,
Francis Xavier Engineering College,
Vannarpettai, Tirunelveli, Tamil Nadhu.
antomosesmukilana.ug18.ci@francisxavier.ac.in, arumugamessakis.ug18.ci@francisxavier.ac.in,
akasharavinds.ug18.ci@francisxavier.ac.in

Abstract- The industrial wastes due to their high performance when blended with the building materials generated great impact in the field of structural engineering. Many industries are looking for the cos effective use of their industrial waste. This paper represents the result of an experimental investigation carried out to study the gypsum with sugarcane bag asses' ash in polymer impregnated mortar. Gypsum and sugarcane bag asses ash are waste materials from various industry. In this report gypsum was partially replaced with three percentages (10%, 20%, and 30%) of bag asses' ash weight. Gypsum mortar was prepared by in the mix ratio 1:2 control mix mortar. After the initial test is carried out the specimens are casted and cured for 28 days at room temperature. The specimens are immersed in PVA solution for 5 minutes. After that this specimen are dried out and the compressive strength test as well as split tensile strength test is determined.

Keywords- Gypsum, Sugarcane bagasse ash, PVA solution, Fine aggregate.

INTRODUCTION

Contemporary Civil engineering is permanently setting new conditions concerning the quality of engineering materials. These conditions have to be completely fulfilled in order to increase the durability, serviceability and cost effectiveness of modern buildings.

The composite materials, which will be the main subject of this paper, are offering great possibilities in the field of research and combination of more advanced solutions in order to keep up with contemporary trends.

In any construction brick masonry is very much of used to make a walling units and in that gypsum mortar is one of the important ingredients it makes up as little as 7% of total volume of brick masonry and it also prevent moisture and air penetration so in short gypsum mortar is very much of use in brick masonry.

So if we change certain amount of gypsum mortar with Sugarcane bagasse ash materials which is less in cost than gypsum and it also reduces the danger to the environment so it is essential to check that how much amount of gypsum is replaced by various materials.

The aim of this research is to Sugarcane bagasse ash materials as an addition in gypsum mortar accordingly in the range of 10%, 20%, and 30% by weight of 1:2 proportion of mortar.

II. MATERIALS USED

1. Gypsum:
Gypsum makes an ideal building material because it is fire resistant, abundant, economical, versatile, and fairly strong. It also can reduce or control sound, and its use can have environmental benefits.

Fig 1. Gypsum.

2. Fine aggregate:
The sand should be free from any chemicals, salts, clay, dust and organic matters. It should be completely pass through IS sieve of 3.75 mm size and retain completely in 150 micron IS sieve.

3. Sugarcane Bagasse Ash:
The sugarcane bagasse consists of approximately 50% of cellulose, 25% of hemicellulose and 25% of lignin.

Fig 2. Sugarcane Ash.

4. Water:
Normal water.

5. PVA solution:
The polymer is normally supplied in powder form and several grades are available with varying viscosity and solubility characteristics.

6. Gypsum Mortar:
Gypsum is a soft sulfate mineral composed of calcium sulfate dihydrate, with the chemical formula caso4·2h2o. It is widely mined and is used as a fertilizer, and as the main constituent in many forms of mortar, blackboard chalk and wallboard.

7. Sugarcane Bagasse Ash:
Sugarcane is one of the most important crops in the world. One of its byproduct is sugarcane bagasse, which is used as fuel in cogeneration boilers. Thus, the sugar and alcohol industry can be regarded as a sustainable and energy efficient sector.

Compressive strength of concrete (N/mm2) = Load (KN)/Area (mm2)
Standard dimension of the specimen = 70.6 mm×70.6mm×70.6mm

Fig 3. Sugarcane Ash.

III. METHODOLOGY

The mix proportion of the materials was adopted from the literature surveys and the materials required for the work are also collected. The initial tests were performed to determine the physical and chemical properties of the materials used in the mortar. These properties helped in the determination of the water binder ratio of the gypsum mortar. The final testing is then done on the specimens that has been prepared by proper mixing, casting, demoulding and curing. The testing on the cured specimens gave the details of strength and of the sample.

IV. PRILIMNARY TESTING

The initial tests were conducted on the collected materials which gives the physical and chemical characteristics of the materials used in the work. It gave the details of fineness, consistency, setting time and specific gravity of gypsum. The results of the initial tests performed on the materials were listed below.

Gypsum Fineness = 25 % Initial setting time = 10 minutes Final setting time = 40 minutes Specific Gravity = 2.56 Fine Aggregate Specific Gravity = 2.48 Fineness Modulus = 2.76

Table 4.1

Mix id	gypsum	Sugarcane bagasse ash	Fine aggregate
R1	100	0	100
R2	90	10	100
R3	80	20	100
R4	70	30	100

V. RESULT AND DISCUSSION

Table 2. Compressive strength of gypsum mortar of gypsum mortar.

Specimen	Load in KN	Compressi ve strength in N/mm2 (28 days)	Average compressi ve strength in N/mm2
R1	149	29.84	29.2
	141	28.21	
	143	28.76	
R2	110.2	22.3	23.56
	117.6	23.42	
	120.6	24.12	
R3	133.1	26.7	27.6
	141	28.2	
	139	27.8	
R4	93	18.6	18.2
	86	17.2	
	95	18.9	

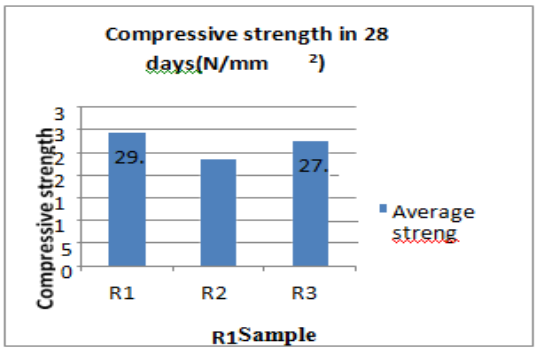

Fig 4. Compressive strength of gypsum mortar for R1 sample.

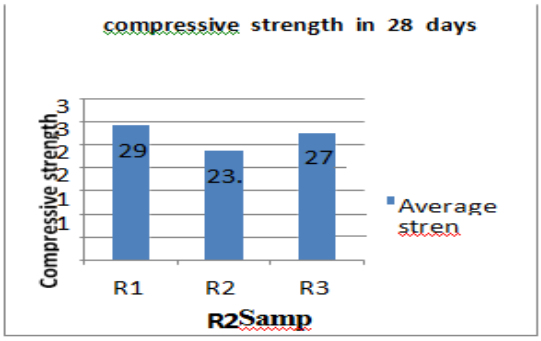

Fig 5. Compressive strength of gypsum mortar for R2 sample.

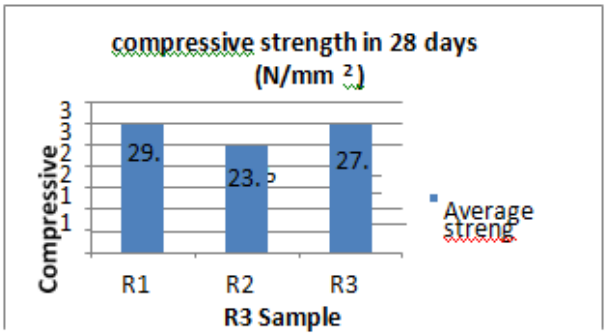

Fig 6. Compressive strength of gypsum mortar for R3 sample.

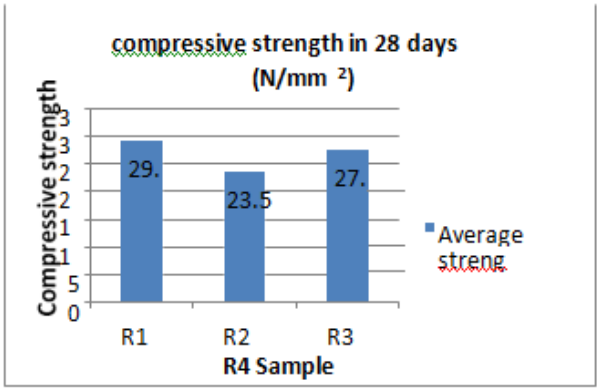

Fig 7. Compressive strength of gypsum mortar for R4 sample.

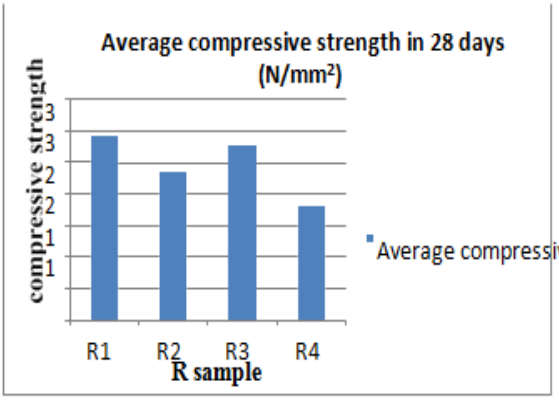

Fig 8. Average Compressive strength of gypsum mortar for R samples.

VI. FOR COMPRESSIVE STRENGTH

- In Compressive Strength R2 Decreases The 20% Of Nominal Mix
- By R2 Sample Decreases The 13.4% Of R3 Sample
- R3 Sample Value Increases The 27.1% Of R4 Sample
- R2 Value Increases The 13 % Of R4 Sample

VII. FOR SPLIT TENSILE STRENGTH

- By the value of S2 Sample increases the 9% of nominal mix
- By the value of S2 Sample increases the 9% of S3 Sample
- In S3 sample increases the 26% of S4 sample
- In S2 sample increases the 35% of S4 Sample

VIII. CONCLUSION

By sinking on PVA solution it increases the strength of gypsum mortar. The results showed that, the mortar with 20% SCBA replacement after 28 days of curing, showed maximum strength when compared to mortar with other percentage replacement mixes. In case of strength the utilization of bagasse ash in mortar solves the problem of its disposal thus keeping the environment free from pollution. In the economic point of view, the gypsum replaced by SCBA saves money. Since bagasse ash is a by-product material, its use as a gypsum replacing material.

In addition its use resolves the disposal problems associated with it in the sugar industries and thus keeping the environment free from pollution. The improvement in compressive strength of mortar by partially replacing gypsum by SCBA and sink in PVA Solution. The study in turn is useful for various resource persons involved in using SCBA material to develop sustainable construction material.

REFERENCE

[1] Mrs.U.R.Kawade, Mr.V.R.Rathi, Miss Vaishali D. Girge, "Effect of use of Bagasse Ash on Strength of Concrete", ISSN: 2319-8753 Vol. 2, Issue 7, July 2013.
[2] Abdolkarim Abbasi and Amin Zargar," Using Baggase Ash in Concrete as Pozzolan".
[3] Prashant O Modania, M R Vyawahare," Utilization of Bagasse Ash as a Partial Replacement of Fine Aggregate in Concrete", Procedia Engineering 51 (2013) 25 – 29.
[4] R.Srinivasan, K.Sathiya, "Experimental Study on Bagasse Ash in Concrete", International Journal for Service Learning in Engineering ,Vol. 5, No. 2, pp. 60-66, 2010.
[5] DAVisW.A. The Nature of the Changes Involved in the Production and Setting of Plaster of Paris, J. Soc. Chem. Ind., 26:72 7, 1907.
[6] MAHLER, D. B. Hardness and Flow Properties of Gypsum Materials, J. Pros. Den., 1:188, 1951.