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Comparative Experimental Analysis on Concrete by Partial Replacement of Fine Aggregate with Glass Powder

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Abstract: ***Natural resources remain very limited in number, and the constant use of natural resources in a particular industry creates various problems. If natural resources are used at this rate, then the time is near when we have to stop using concrete as a building material and need to look for alternatives. If we have to stop this cause, then we must use natural resources better, as well as switch to waste as an alternative to natural resources. This shift not only reduces the fear of scarcity of natural resources for a particular industry, but also reduces the cost of production. Waste not only affects our environment, but also causes disposal problems. In this study, the properties of glass dust concretes as a fine unit were investigated.***
Keywords: Glass, compressive strength, concrete and shrinkage

I. INTRODUCTION

The construction industry is used not only in the construction of buildings, but also in other areas, such as bridges, roads, harbors, dams, railways and more. It is relatively economical, easy to make proposals of continuous strength, and it really plays a role in development and improvement or modern life. It is a composite material consisting of sand, cement, aggregate and water. Fresh concrete can be formed into any form of desire. Concrete life is very high, so it can be used as a universal material. In concrete, cement is used as a binder that tends to bind. Due to the increase in activities in different regions and utilities, the deterrence of natural resources is forced due to overexploitation. This is a threat to the environment. Also, the use of ordinary material is becoming expensive every day. Thus, the preservation of natural material is a great challenge for civil engineers. Using alternative materials that have partially decreased, there is only a way to search for materials that can completely or partially replace natural material in the construction industry. Various alternative materials are used as partial to completely replace ordinary material, for example. Rice husks of ash, amanita, sugar cane, ash, coconut shell, crushed sand, processed unit, etc. In this study, the properties of glass dust concretes as a fine unit were investigated.

II. REVIEW OF LITERATURE

Bajad M.N. etc. (2011) this work was aimed at clarifying the possibility of using recycled glass as a fine aggregate replacement. Test results showed that the drop and compaction ratios are reduced due to the angular size of the waste glass, and the air content is also increased due to the presence of so many fine particles in the waste glass. It was also found that compressive strength, flexural strength and tensile strength decrease with an increase in the percentage of waste glass.

Divakar Y. et al (2012) conducted a study on the use of plastic as a replacement for sand. Various replacements of 0%, 10%, 15% and 20% in the form of a thin population were made. Various concrete mixtures have been tested at room temperature, and the tests include a decline, fresh density, dry density, compressive strength, flexural strength, and strength and curing were performed after 3, 7, 14 and 28 days. The results showed a decrease in the reproduction of micro cracks due to the inclusion of plastic.

Rakesh Sakale et al (2015) conducted a study on the use of plastic waste as a rough aggregate replacement and the effect on fresh and hardened properties of concrete after replacement. This study examined various properties of concrete, such as bulk density, air content, performance, compressive strength, tensile strength, elasticity module, impact resistance, permeability and abrasion resistance.

III. METHODOLOGY

1) *Cement:* This paper used the locally available brand Portland Pozzolana Cement (based on ash) Birla Gold, which confirms IS: 1489 (part 1) -1991. Having a specific gravity of 3.12 and a normal consistency of 33%
2) *Coarse Aggregate:* this work used two units measuring 20 mm and 10 mm from the local ones available from Bhopal. The proportion of the coarse unit was 2.72 for both fractions

3) *Fine Aggregate:* those particles that pass 9.5 mm (3/8 inch).) sieve, almost completely passes 4.75 mm (No. 4) sieve and preferably held at 75 μm (No. 200) sieve is called a small unit. To increase performance and economy, which is reflected in the use of less cement, the thin unit must have a rounded shape. The purpose of the subtle set is to fill the voids in the rough population and act as a performance agent.

4) *Glass Powder:* Amorphous glass (non-crystalline) and innocence, super chilled liquid, not solid. Glass can be made with excellent homogeneity of different shapes and sizes from small pieces of fiber meter. Primary glass consists of sand, soda, limestone and other additives (Iron, Chrome, Alumina, Lead and Cobalt). Glass was used as units in road construction, construction and masonry.

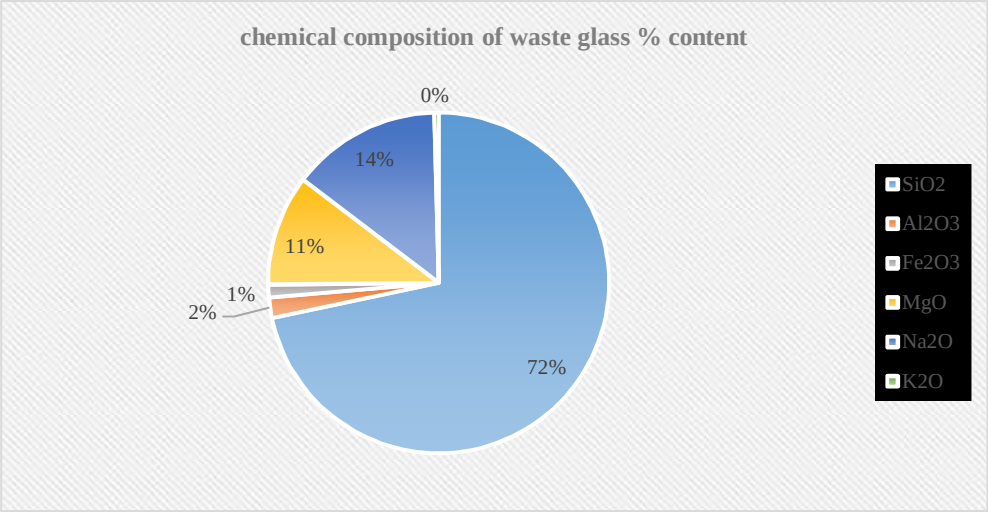


Fig1: chemical composition of waste glass % content

Fig2: Cube moulds prepared for the concrete

IV. RESULTS

From the experiment carried out following results are obtained:

Table 1: 7 days Compressive strength (N/mm2)

Sr. No.	Replacement by glass powder (%)	7 days Compressive strength (N/mm2)
1	0	19.255762
2	5	23.498029
3	10	26.989178
4	15	27.478072
5	20	24.855822
6	25	20.077993

Table 2: 14 days Compressive strength (N/mm2)

Sr. No.	Replacement by glass powder (%)	14 days Compressive strength (N/mm2)
1	0	25.995278
2	5	31.722339
3	10	36.43539
4	15	37.095397
5	20	33.555359
6	25	27.10529

Table 3: 28 days Compressive strength (N/mm2)

Sr. No.	Replacement by glass powder (%)	28 days Compressive strength (N/mm2)
1	0	28.250302
2	5	31.189223
3	10	37.433734
4	15	39.011529
5	20	34.244811
6	25	28.54475

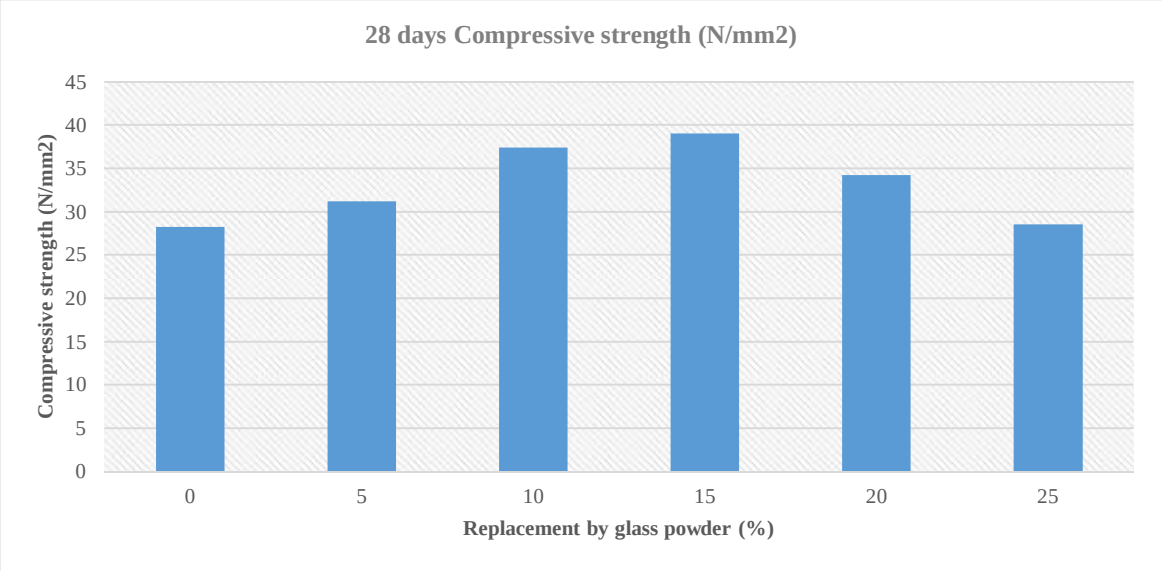


Fig.3: 28 days Compressive strength (N/mm2)

From the above figure it is observed that the compressive strength of the concrete is higher for the 15% replacement of fine aggregate by glass powder while it goes on decreasing after 15%.

Table 4: 7 days Split tensile strength (N/mm2)

Sr. No.	Replacement by glass powder (%)	7 days Split tensile strength (N/mm2)
1	0	4.6222717
2	5	4.8667187
3	10	4.7889401
4	15	5.4889476
5	20	4.4667145
6	25	4.1333776

Table 5: 14 days Split tensile strength (N/mm2)

Sr. No.	Replacement by glass powder (%)	14 days Split tensile strength (N/mm2)
1	0	5.3156124
2	5	5.5967266
3	10	5.5072811
4	15	6.3122898
5	20	5.1367216
6	25	4.7533842

Table 6: 28 days Split tensile strength (N/mm2)

Sr. No.	Replacement by glass powder (%)	28 days Split tensile strength (N/mm2)
1	0	5.512
2	5	5.694
3	10	5.603
4	15	6.422
5	20	5.226
6	25	4.836

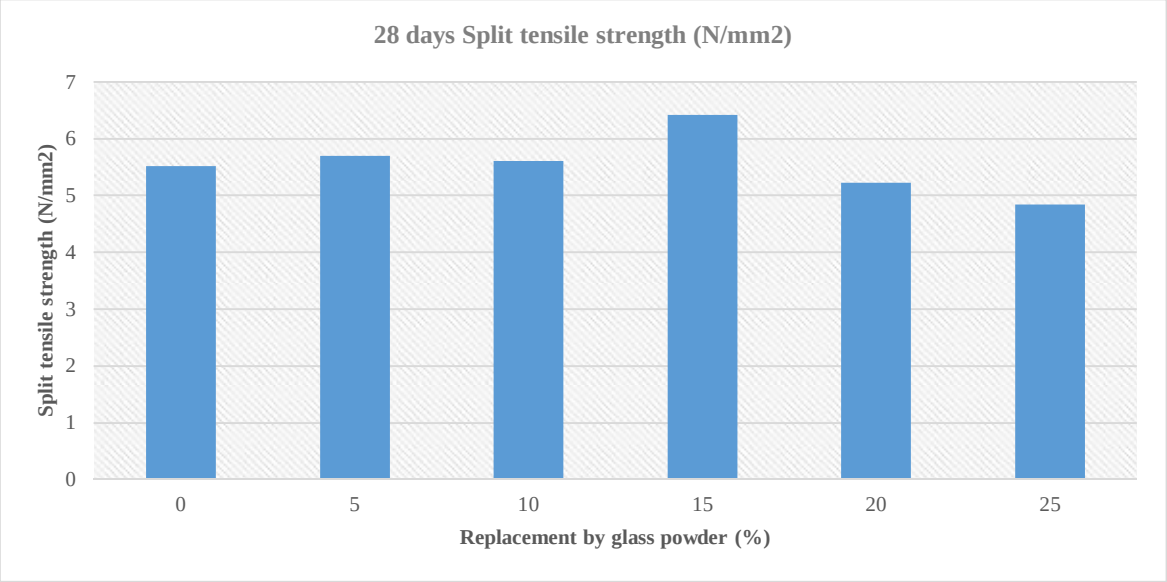


Fig.4: 28 days Split Tensile strength (N/mm2)

From the above figure it is observed that the Split tensile strength of the concrete is higher for the 15% replacement of fine aggregate by glass powder while it goes on decreasing after 15%.

Table 7: Slump value of concrete

Sr. No.	Replacement by glass powder (%)	Slump value
1	0	27.12
2	5	31.64
3	10	37.29
4	15	42.94
5	20	50.85
6	25	54.24

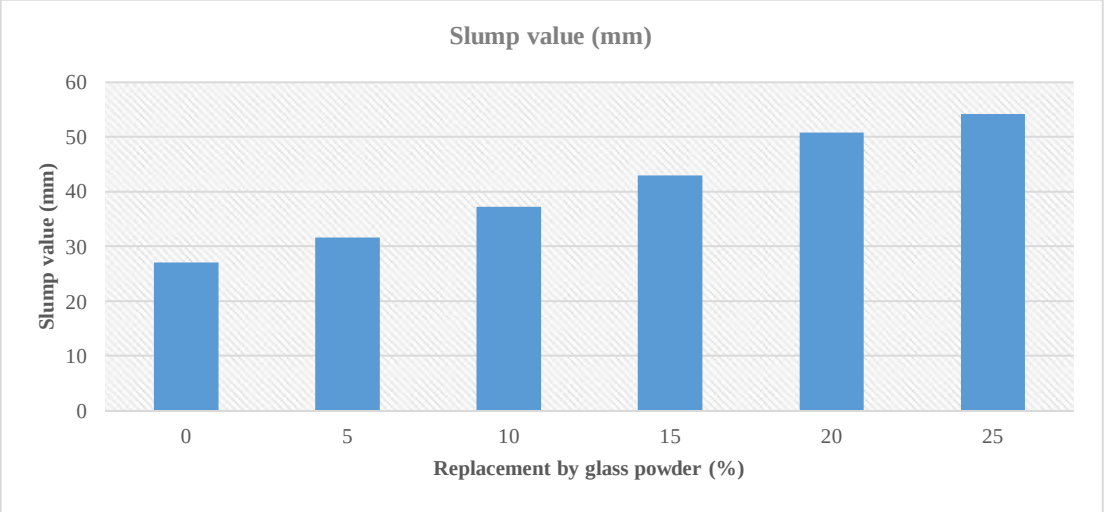


Fig.5: Slump value of concrete

From the above figure it is observed that the Slump value of the concrete is higher for the 25% replacement of fine aggregate by glass powder while it goes on increasing upto 25%.

Table 8: Flexural strength (N/mm2) of concrete

Sr. No.	Replacement by glass powder (%)	7 days Flexural strength (N/mm2)	14 days Flexural strength (N/mm2)	28 days Flexural strength (N/mm2)
1	0	3.25816	3.65848	4.45912
2	5	3.4472	4.06992	4.6704
3	10	3.90312	4.41464	5.27088
4	15	4.15888	4.57032	5.34872
5	20	4.01432	4.51472	5.08184
6	25	3.98096	4.41464	4.98176

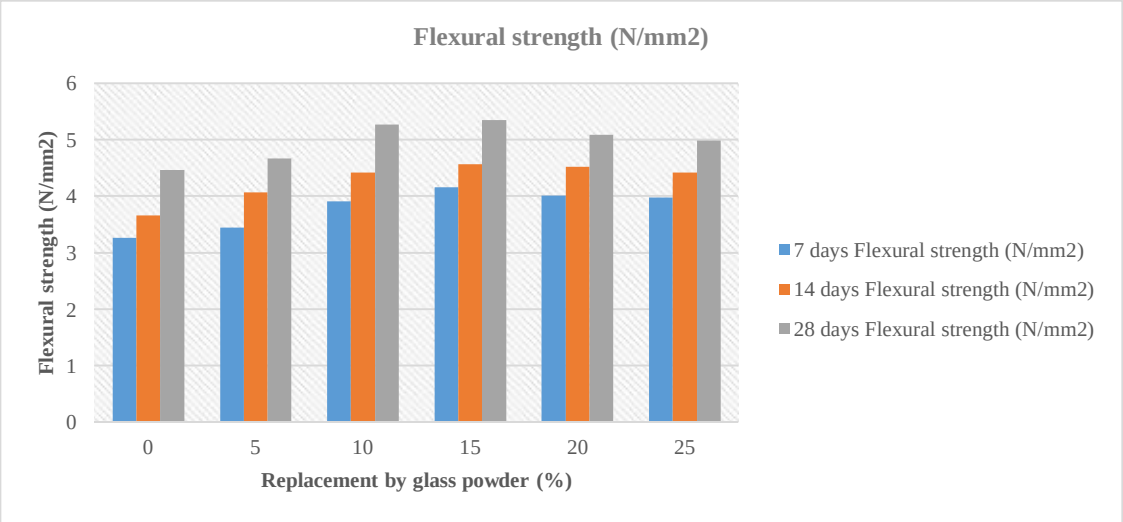


Fig 6: Flexural strength of concrete

From the above figure it is observed that the flexural strength of the concrete is higher for the 15% replacement of fine aggregate by glass powder while it goes on decreasing after 15%.

Table 8: Dry weight and wet weight of concrete

Sr. No.	Replacement by glass powder (%)	Dry weight before curing (g)	Wet weight after curing for 28 days (g)	water absorbed (g)
1	0	8848.35	8936.55	88.2
2	5	8817.9	8896.65	78.75
3	10	8716.05	8769.6	53.55
4	15	8632.05	8676.15	44.1
5	20	8543.85	8582.7	38.85
6	25	8447.25	8464.05	33.6

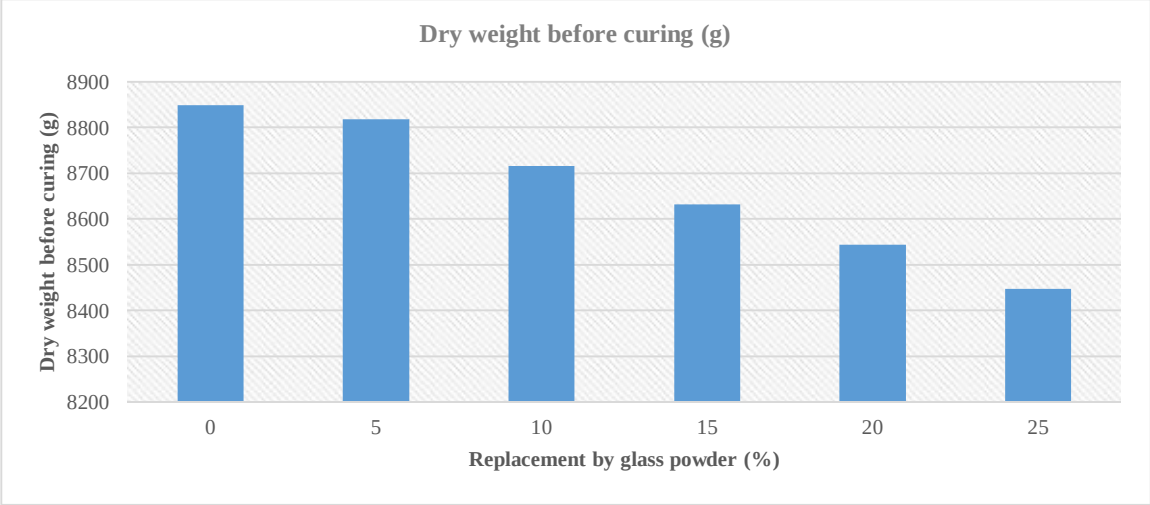


Fig 7: Dry weight before curing (g) of concrete cube

From the above figure it is observed that the Dry weight before curing (g) of concrete cube is higher for the 0% replacement of fine aggregate by glass powder while it goes on decreasing upto 25%.

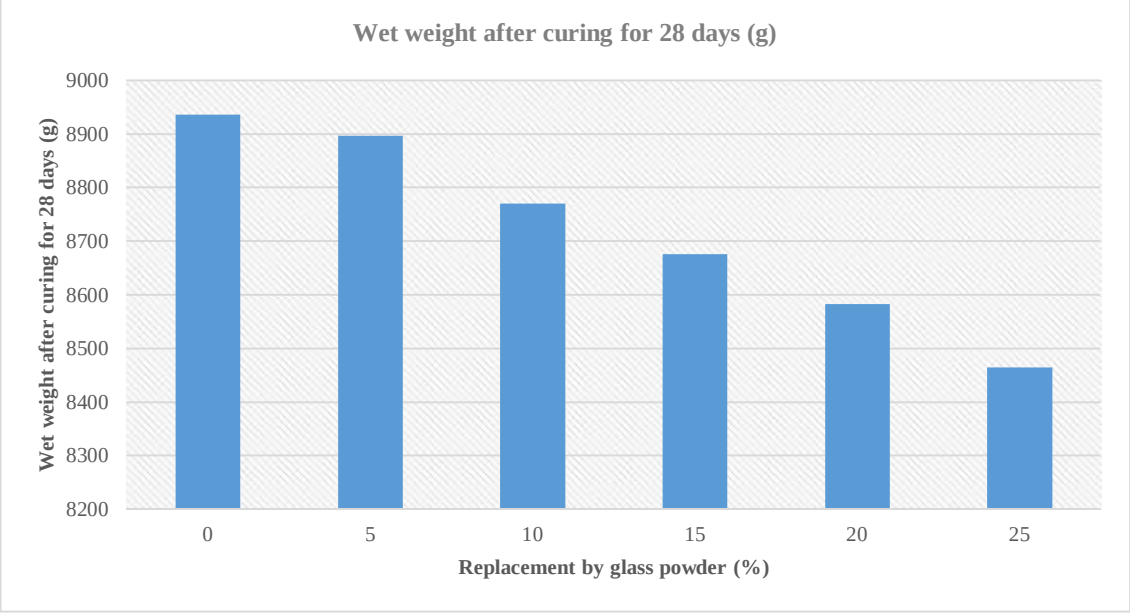


Fig 8: Wet weight before curing (g) of concrete cube

From the above figure it is observed that the wet weight before curing (g) of concrete cube is higher for the 0% replacement of fine aggregate by glass powder while it goes on decreasing upto 25%.

V. CONCLUSION

The conclusions from the above study are as follows:

A. The From the above results it is observed that the compressive strength of the concrete is higher for the 15% replacement of fine aggregate by glass powder while it goes on decreasing after 15%.

B. From the above results it is observed that the Split tensile strength of the concrete is higher for the 15% replacement of fine aggregate by glass powder while it goes on decreasing after 15%.

C. From the above results it is observed that the flexural strength of the concrete is higher for the 15% replacement of fine aggregate by glass powder while it goes on decreasing after 15%.

D. From the above results it is observed that the Dry weight before curing (g) of concrete cube is higher for the 0% replacement of fine aggregate by glass powder while it goes on decreasing upto 25%.

E. From the above results it is observed that the wet weight before curing (g) of concrete cube is higher for the 0% replacement of fine aggregate by glass powder while it goes on decreasing upto 25%.

REFERENCES

[1] A.K. Shau, Sunil Kumar and A.K. Sachan (2003) “crushed stone waste as fine aggregate for concrete” the Indian concrete Journal, pp 885848.

[2] Akshay Sawant, Arun Sharma, Rushikesh Rahate, Neeraj mayekar, Prof.M.D. Ghadge.” Partial replacement of sand with sawdust in concrete “. Vol5 issue :03 march 2018.

[3] Bajad M.N., Modhera C.D. and Desai A.K (2011) – effect of glass on strength of concrete subjected to sulphate attack || International journal of Civil Engineering Research and development (IJCERD), ISSN 2228-9428(print) ISSN 2248-9436(online), vol 1, no 2

[4] BhatVeena V, Rao N. Bhavanishankar “Influence of Glass Powder on The Properties of Concrete” International Journal of Engineering Trends and Technology (IJETT), ISSN: 2319 –8753, Volume16, Number-5, October 2016.

[5] Brajesh kumar Suman, Vikas Srivastava JMEST: Journal of Multidisciplinary Engineering Science and Technology ISSN: 3159-0040, vol. 2 Issue 4, April – 2015

[6] Divakar Y., Manjunath S. and Dr. Aswath M.U., “Experimental investigation on behavior of Concrete with the use of granite fines”, International Journalof Advanced Engineering Research and Studies, Vol. I Issue IVJuly-Sept., 2012, pp. 84-87.

[7] Dr. G. Vijayakumar, Ms H. Vishliny, Dr. D. Govindarajulu studies on glass powder as partial replacement of cement in concrete production. IJETAE: International journal of emerging technology and advanced engineering. Volume 3, Issue 2, Feb 2013.

[8] Er. Lalit Kumar , Er. Arvinder Singh A study on the strength of concrete using crushed stone dust as fine aggregate. IJRASET: International Journal for Research in Applied Sciencde & Engineering Technology. ISSN: 2321-9653 vol. 3 Issue I, Jnauary 2015.

[9] J.D. Chaitanya kumar, G.V.S. Abhilash, P.Khasim Khan, G.Mnikanta sai, V. Tarakh ram experimental studies on glass fiber concrete. AJER: American Journal of Engineering Research e-ISSN: 2320-0847 : p-2320-0936 volume-5, Issue-5, pp-100-104.

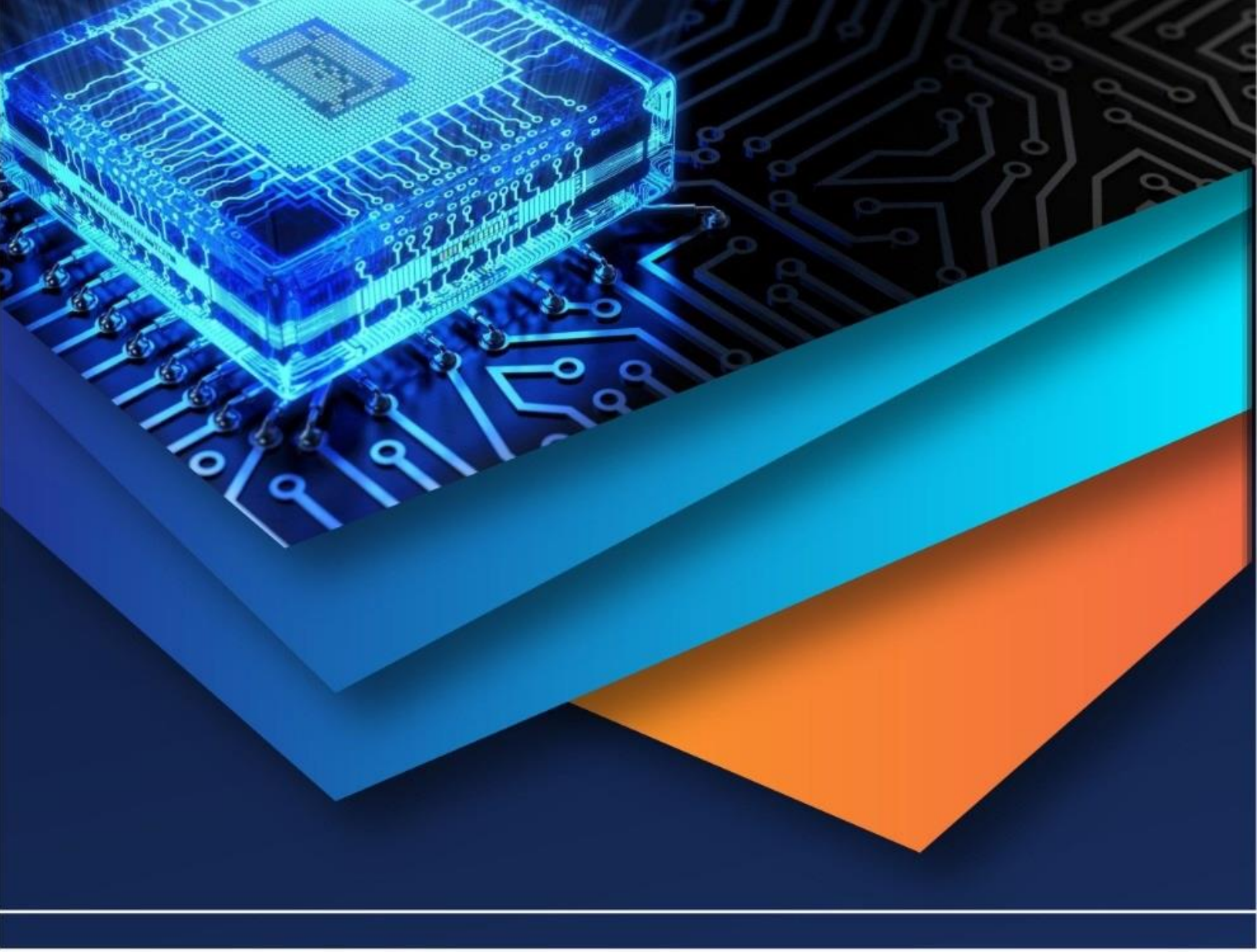
[10] Nwaubani Sunny O. and Poutos Konstantinos I. (2013) “The Influence of Waste Glass Powder Fineness on the Properties of Cement Mortars” International Journal of Application or Innovation in Engineering and Management (IJAIEM) Volume 2, Issue 2, ISSN 2319 – 4847.

[11] Prakash Rao, D.s. & Giridhar Kumar, V.(2004) “Investigations on concrete with stone crusher dust as fine aggregate”.The Indian Concrete Journal, M.E. Thesis submitted to Osmania University, Hyderabad, India.

[12] Rakesh Sakale, Sourabh Jain and Seema Singh, “Experimental Investigation on Strength of Glass Powder Replacement by Fine Aggregate in Concrete with Different Dosages”, International Journal of Advanced Research in Computer Science and Software Engineering, Vol.5, Issue 12, December 2015, pp. 386390, ISSN: 2277-128X.

[13] Reni Mullukattil Lukose / International Journal of Research in Modern Engineering and Emerging Technology Vol. 1, Issue: 6, July: 2013 (IJRMEET) ISSN: 2320-6586.

[14] Vandhaiyan R, Ramkumar K and Ramya R (2013)- Experimental study on replacement of glass powder || International journal of Engineering Research and technology (IJERT) vol 2 issue 5, may ISSN: 2278-0181.



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