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Mechanical Properties AR Glass Fibre Concrete by Using Dunite Powder

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Abstract: ***In the modern world. The most significant and commonly utilised material, concrete, must frequently have a very high strength and appropriate workability.Alkali resistant fibres with a high capacity for dispersion were created as a consequence of research in glass fibre reinforced concrete, which increased long-term durability.Alkali resistant glass fibres have been used in the current experimental examination to explore the impact on compressive and split tensile strength on M30 grade of concrete.Concrete is found to become up to 40% stronger when dunite is used as a cement substitute rather than conventional cement.Test can be carried for 7 and 28 days. Studies based on periodic cement rate records indicate that the dunite powder is less expensive than cement, on average. The substitution of dunite powder will predominate in cement consumption in the future. It enhances, among other things, Split tensile strength, compressive strength.***
Keywords: Alkaline glass fiber, Dunite powder, compressive strength, split tensile.

I. INTRODUCTION

After water, concrete is the material that is used the most frequently, and every year, more than six billion tonnes of cement are produced. Concrete is specifically used in several applications, including new inventions, corrections, recoveries, and retrofitting. Divider boards, doorsills, bar, columns and that's just the tip of the iceberg are examples of solid structure components that come in a variety of sizes and shapes.

For the construction of mechanical, commercial, and residential floor pieces, post-tensioned chunks are the recommended method. It is advantageous to categories cement use based on where and how it is produced, as well as its method of application, as they have different requirements and attributes.With the development of technology and an enlarged field for using cement and mortars, the demand for concrete has increased to rank second only to that of water. As a result, various features of ordinary cement had to be changed to make it more suitable for various situations, wise, and environmentally friendly. The use of cementation materials is a result of this.

Glass fibre reinforced concrete (GFRC), a new composite material with discrete discontinuous fibres that enhances the performance of concrete, is created by reinforcing conventional concrete with A.R glass fibre and various chemical admixtures. Discrete fibres boost the concrete's ability to resist cracking and serve as crack arresters.

A member of the peridotite group of rocks, dunite is an igneous rock having an ultramafic composition and a coarse-grained or phaneritic texture. 90% of the dunite is olivine, with the other 10% consisting mostly of trace quantities of pyroxene, chromite, magnetite, and pyrope.

II. OBJECTIVES

The objectives of this study are as follows

1) To assess the usage of dunite powder in concrete.
2) To determine the compressive and spilt tensile strength of concrete.

III. MATERIALS

A. Cement

A binding agent, cement is a substance used in construction to keep the other building elements together. The main component of concrete is coarse aggregate, whereas fine aggregate is utilised to fill the spaces left by the coarse aggregates. Mortar is simply plain cement combined with fine aggregate and water, whereas concrete is simply cement combined with coarse aggregate.

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B. Aggregates

Since aggregates make up about 80% of the volume of concrete, their characteristics have a significant impact on how the material behaves.

C. Alkali Resistant Glass fiber

Glass fibre treated with zirconium oxide to assist it withstand attack from alkalinity is known as alkali resistant (AR) glass fibre. Given the alkaline environment of concrete, this is a crucial component of these fibres. The alkaline environment of the aggregate in concrete causes regular fibreglass (E-glass) to deteriorate. Since the 1970s, AR fibre have been utilised extensively in the concrete industry.

D. Dunite Powder

Dunite (Magnesium Iron Silicate) is a plutonic rock made of various primary minerals that regularly undergo geological processes that are more or less complex to change them into secondary minerals. Olivine is the primary mineral present in dunite, which is categorised chemically as a basic rock.

IV. EXPERIMENTAL INVESTIGATIONS

A. Compressive Strength Results

The compressive strength conducted in compression testing machine for the cast and cured specimens and the results are furnished in table 1 to 3..

Table 1: Compressive strength of concrete with dunite powder as partial replacement of cement

S.No.	Dunite powder	Compressive strength of concrete, N/mm^2	
		7 days	28 days
1	0%	26.55	39.11
2	10%	27.12	39.81
3	20%	27.53	40.19
4	30%	28.71	41.66
5	40%	29.45	42.09
6	50%	27.62	40.44

Table 2: Compressive strength of concrete with AR glass fibers

S.No.	Percentage of AR glass fibers	Compressive strength of concrete, N/mm^2	
		7 days	28 days
1	0%	26.55	39.11
2	0.03%	32.15	46.19

Table 3: Compressive strength of concrete with dunite powder and AR glass fibers

S.No.	Percentage of AR glass fibers	Compressive strength of concrete, N/mm^2	
		7 days	28 days
1	0%	26.55	39.11
2	40%DP+0.03%ARGF	33.42	47.68

B. Split Tensile Strength Results

The split tensile strength conducted in compression testing machine for the cast and cured specimens and the results are furnished in table 4 to 6..

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Table 4: Split tensile strength of concrete with dunite powder as partial replacement of cement

S.No.	Dunite powder	Split tensile strength of concrete, N/mm^2	
		7 days	28 days
1	0%	2.58	3.81
2	10%	2.62	3.86
3	20%	2.71	3.97
4	30%	2.83	4.12
5	40%	2.96	4.23
6	50%	2.69	3.98

Table 5: Split tensile strength of concrete with AR glass fibers

S.No.	Percentage of AR glass fibers	Split tensile strength of concrete, N/mm^2	
		7 days	28 days
1	0%	2.58	3.81
2	0.03%	3.18	4.55

Table 6: Split tensile strength of concrete with dunite powder and AR glass fibers

S.No.	Percentage of AR glass fibers	Split tensile strength of concrete, N/mm^2	
		7 days	28 days
1	0%	2.58	3.81
2	40%DP+0.03%ARGF	3.34	4.75

V. CONCLUSION

1) At 40% DP, the compressive strength of concrete is 29.45 and 4.23 N/mm^2 at 7 and 28 days.
2) For 0.03% AR glass fibers the compressive strength is 32.15 and 46.19N/mm^2 at 7 and 28 days.
3) With 0.03% AR glass fiber + 40% DP the maximum compressive strength is 33.42 and 47.68N/mm^2 at 7 and 28 days.
4) At 40% DP, the split tensile strength of concrete is 2.96 and 6.06N/mm^2 at 7 and 28 days.
5) For 0.03% AR glass fibers the split tensile strength is 3.18 and 4.55 N/mm^2 at 7 and 28 days.
6) With 0.03% AR glass fiber + 40% DP the maximum split tensile strength is 3.34 and 4.75 N/mm^2 at 7 and 28 days.

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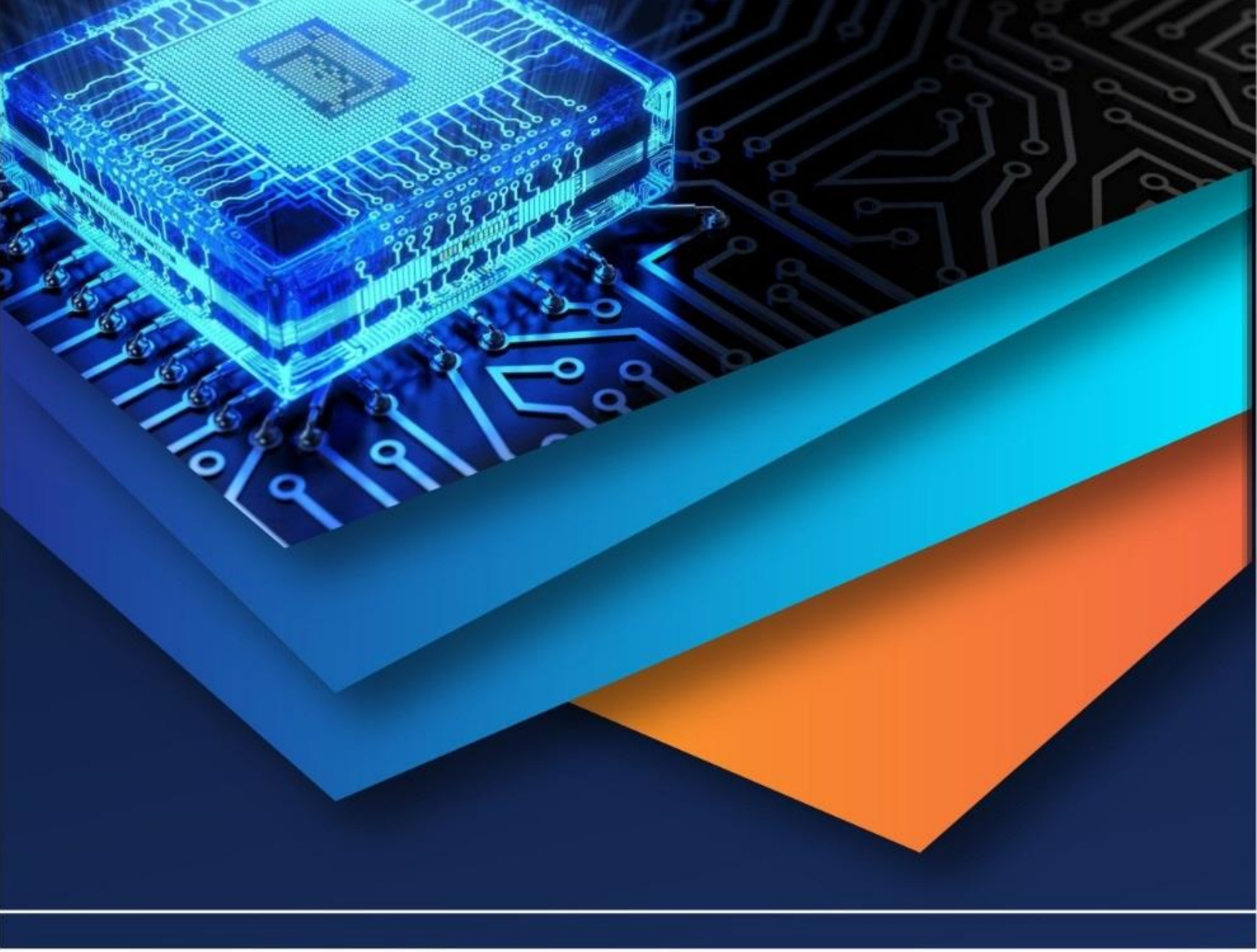

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