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An experimental investigation was conducted using waste plastic fiber-reinforced concrete and red mud

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Abstract
The field of concrete Technology is undergoing immense changes in nowadays. A wide range of kinds of cements are altering the development business. Among them the fiber fortified solid, ferro cement, polymer solid, prepared blend concrete and so forth are assuming significant job. The fiber fortified cement in which the strands are scattered haphazardly has numerous applications in structural designing field.

The plastic is causing an ecological contamination since it is a non-biodegradable material. The plastics are causing the ecological contamination. The plastics being non-biodegradable material don't rot and it even ruin the richness of land, comparatively another contamination causing modern waste is Red mud. Red mud is a buildup from aluminum manufacturing plants where bauxite is utilized as metal for the creation of aluminum. The removal of this red mud has become an issue to the businesses. Alongside this it causes ecological contamination

This Paper presents the consequences of waste plastic fiber strengthened solid when red mud is included it. Various rates of waste plastic strands are utilized in the solid containing red mud. The quality properties of waste plastic filaments fortified solid like Compressive quality, Tensile quality, Flexural quality and Impact quality are concentrated alongside functionality attributes.
The field of concrete

Keywords: *Fibre reinforced concrete, waste plastic, Red mud, Strength and workability characteristics.*

I. Introduction

Plain concrete is weak in tension and has limited ductility and little resistance to cracking. Micro cracks are present in concrete and because of its poor tensile strength; the cracks propagate with the application of load, leading to brittle fracture of concrete.

Micro cracks in concrete are formed during its hardening stage. A discontinuous heterogeneous system exits even before the application of any external load. When the load is applied, micro cracks start developing along the planes, which may experience relatively low tensile strains, at about 25-30% of the ultimate strength in compression. Further application of the load leads to uncontrolled growth of micro cracks. The low resistance to tensile crack propagation in turn results in a low fracture toughness, and limited resistance to impact and explosive loading.

The low tensile strength of concrete is being compensated for in several ways, and this has been achieved by the use of reinforcing bars and also by applying pre-stressing methods and the introduction of fibres to form fibre reinforced concrete (FRC). The fibre reinforced concrete is one in which the fibres are dispersed uniformly through out the mass of concrete. Many types of fibres like steel fibers, GI fibres, glass fibres, and asbestos fibres etc. can be used in the production of fibre reinforced concrete.

Alternatively waste plastic can be made use in production of fibre reinforced concrete. This is a non-biodegradable material. It is causing environmental pollution in different ways. The plastic is a non-perishable material. It cannot be dumped in soil. If dumped in soil it causes soil pollution. It cannot be disposed in water. If disposed in water, it causes water pollution. It cannot be burnt also. If burnt, it causes air pollution by releasing many toxic gases. For many countries the disposing of plastic is becoming a big headache.

Red mud is a waste product of aluminium industry, which uses bauxite as ore. This red mud is causing the problem of storing and disposal to the aluminium industry, this red mud is alkaline in nature with little cementations property.

There are many industrial wastes, which are causing environmental pollution. The safe disposal of these industrial wastes is a big problem to the industrialist as well as to environmentalist. These industrial wastes, if used in building construction as a construction material, it is welcoming step

II. Materials Used

Cement: Ordinary Portland Cement-53 grade was used having a specific gravity of 3.15 and it satisfies the requirements of IS: 12269-1987 specifications. The physical properties of tested cement are given in Table 2.1

Table 2.1: Physical properties Ordinary Portland Cement-53 grade (IS: 12269-1987)

Properties	Results	Permissible limit as per IS: 12269-1987
Fineness	30.3 m^2/N	Should not be more than 22.5 m^2/N
Normal consistency	30	-
Specific gravity	3.15	-
Setting Time a. Initial b. Final	115 Min. 270 Min.	Should not be less than 30 Min Should not be more than 600 Min
Soundness test a. Le-chat expansion b. Auto clave%	1 0.09	10mm maximum 0.8% maximum
Compressive strength of mortar cubes for a. 3days. b. 7days. c. 28 days	35.5 N/mm^2 47.0 N/mm^2 55.6 N/mm^2	Should not be less than 27 N/mm^2 Should not be less than 37 N/mm^2 Should not be less than 53 N/mm^2

Coarse aggregates: The crushed stone aggregate were collected from the local quarry. The coarse aggregates used in the experimentation were 10mm and down size aggregate and tested as per IS: 383-1970 and 2386-1963 (I, II and III) specifications. The aggregates used were having fineness modulus 1.9. Sieve analyses of coarse aggregate are given in Table.2.2 and physical and mechanical properties of tested coarse aggregates are given in Table 2.3

Table 2.2: Sieve analysis of coarse aggregate (IS: 383-1970)

IS sieve size	Weight retained (grams)	Cumulative weight retained (grams)	Cumulative % weight retained	Cumulative % passing	ISI permissible limit
12.5mm	0	0	0	100	100
10mm	0	0	0	100	85-100
4.75mm	1860	1860	93	7	0-20
2.36mm	93	1953	97.65	2.35	0-5
Pan	47	2000	-	-	-
Total	2000	-	190.65	-	-

Fineness modulus = 190.65/100 = 1.90

Table 2.3: Physical and mechanical properties of coarse aggregate (IS: 2386-1963)

Properties	Results	Permissible limit as per IS: 2386-1963
Impact value	15.50 %	Should not be more than 30% used for concrete
Crushing value	25%	Should not be more than 30% for surface course and 45% other than wearing course
Specific gravity	2.65	In between range 2.6-2.8
Moisture content	0.16%	-

Fine aggregates: Locally available sand collected from the bed of river Bhadra was used as fine aggregate. The sand used was having fineness modulus 2.96 and confirmed to grading zone-III as per IS: 383-1970 specification. Sieve analysis of fine aggregate are given in Table 2.4 and physical properties tested for fine aggregate are given in Table 2.5

Table 2.4: Sieve analysis of fine aggregate (IS: 383-1970)

IS sieve size	Weight retained (grams)	Cumulative weight retained (grams)	Cumulative % weight retained	Cumulative % passing	Grading zone III
10	0	0	0	100	100
4.75	5	1	99	-	90-100
2.36	44	45	09	91	85-100
1.18	30	75	15	85	75-100
600µm	50	125	25	75	60-79
300µm	185	310	62	38	12-40
150µm	120	430	86	14	0-10
Pan	70	500	-	-	-
Total	500 gm	-	296	-	-

Fineness Modulus: 296/ 100 = 2.96

Table 2.5: Physical properties of fine aggregate (IS: 2386-1963)

Properties	Results	Permissible limit as per IS: 2386-1963
Organic impurities	Colourless	Colour less /Straw Colour/Dark Colour
Silt content	0.7%	Should not be more than 6-10%
Specific gravity	2.63	Should be between the limit 2.6-2.7
Bulking of sand	16%	Should not be more than 40%
Moisture content	0.65%	-

III. Observations And Discussions

Based on experimentation conducted the following conclusion can be drawn.

It has been observed that the compressive strength of waste plastic fibre reinforced concrete with red mud increases as the percentage of fibres in it increases upto 2%. The addition of fibres beyond 2% will decrease the compressive strength of waste plastic fiber reinforced concrete i.e. the waste plastic fibre reinforced concrete with red mud shows maximum compressive strength when 2% fibres are used. Therefore, the higher compressive strength can be achieved with the addition of 2% of waste plastic fibres and 15% redmud (by weight cement) and the percentage increase in the compressive strength is 23%.

It has been observed that the tensile strength of waste plastic fibre reinforced concrete with red mud increases as the percentage of fibres in it increases upto 2%. The addition of fibres beyond 2% will decrease the tensile strength of waste plastic fiber reinforced concrete i.e. the waste plastic fibre reinforced concrete with red mud shows maximum tensile strength when 2% fibres are used. Therefore, the higher tensile strength can be achieved with the addition of 2% of waste plastic fibres and 15% redmud (by weight cement) and the percentage increase in the tensile strength is 23%.

It has been observed that the flexural strength of waste plastic fibre reinforced concrete with red mud increases as the percentage of fibres in it increases upto 2%. The addition of fibres beyond 2% will decrease the flexural strength of waste plastic fiber reinforced concrete i.e. the waste plastic fibre reinforced concrete with red mud shows maximum flexural strength when 2% fibres are used. Therefore, the higher flexural strength can be achieved with the addition of 2% of waste plastic fibres and 15% redmud (by weight cement) and the percentage increase in the flexural strength is 34%.

The impact strength of waste plastic fibre reinforced concrete with red mud increases as the percentage of fibres in it increases upto 2%. The addition of fibres beyond 2% will decrease the impact strength of waste plastic fiber reinforced concrete i.e. the waste plastic fibre reinforced concrete with red mud shows maximum impact strength when 2% fibres are used. Therefore, the higher impact strength can be achieved with the addition of 2% of waste plastic fibres and 15% redmud (by weight cement) and the percentage increase of impact strength for first crack and for final failure are 47% and 90% respectively

This may be due to the fact that 2% addition of waste plastic fibres may fit in and interlock the aggregates there by increasing the strength characteristics

Thus it can be concluded that the higher strength characteristics of waste plastic fibre reinforced concrete with redmud can be obtained with 2% addition of fibres in it.

It has been observed that the workability of waste plastic fiber reinforced concrete decreases as the percentage of fibres in it increases.

This is obviously because of less flow of concrete with more fibre content.

Thus it can be concluded that as the percentages of waste plastic fibres increase the workability decreases.

IV.Conclusions

1. It can be concluded that the higher strength characteristics of waste plastic fibre reinforced concrete with redmud can be induced with 2% addition of fibres in it.
2. Higher percentage additions of waste plastic fibres reduce the workability characteristics of waste plastic fibre reinforced concrete

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