CONCRETE WITH COIR FIBRE REINFORCEMNET AND FLYASH AS THE BASE

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Abstract

Objective: To research the conduct of coir fiber as support in geopolymer concrete. Investigation: Low-calcium fly debris is utilized as the creation of geopolymer concrete. Before utilizing in solid coir fiber is treated with latex glue arrangement. Coir fiber of length 25mm with different rates i.e.., 0%, 0.75%, 1.5%, 2.25%, 3% are utilized. The blend of Na2SiO3 arrangement &NaOH result was utilized for fly debris enactment. Restricting operator to fly debris proportion was 0.45.The molarity utilized was 12M (Molars). Surrounding restoring is followed for this work. Discoveries: The different quality parameters were tried at different ages i.e.., 7, 14 and 28 days. Applications: Coir fiber which is going about as support added to oppose the small scale splits. So this can be relevant where the necessity to oppose the small scale splits.

Key words: Fly ash, Latex liquid, NaOH, Na2SiO3, Coir fiber

Introduction

The inorganic alumino-silicate polymer, called geo-polymer which efforts to create ecological concrete which is synthesized from by-product of materials like fly ash which is high in silicon & aluminum. Geo-polymer was introduced in1978, to explain about the mineral binders with alkaline[1]. Geo-polymer has two constituents they are basic materials & alkaline liquids. The basic materials are high in Si & Al. Fly ash constitutes of high amount of Si-Al materials, it has high cementations property, and fly ash is by-product of coal that is available in thermal powerplant[1].

To increase the life of structure is by using bond fiber polymer composites onto the structure. By this the tensile strength and the toughness of the structure increase and it improves deformation characteristics and minimizes the cracking effect of the structure. When these fibre composites are Experimental Study On Coir Fibre Reinforced Flyash Based Geopolymer Concrete with 12m Molar Activator exposed to marine environment they are suffering from degradation because of surface blistering. Due to this degradation the adhesive bond strength is reduced and de-lamination about composites occurs. A further way is to restore steel bars by means of fibers to create a fiber reinforced concrete (FRC)[2].

This type of reinforcing concrete improves the non-reinforced concrete properties which is highly brittle. Enough natural resources are available and researching on these natural resources is going on. Growth of natural fiber composite[3]recently started. These fibers have high in impact strength but have moderate flexural and tensile properties and these are eco-friendly materials. Utilizing of coir fiber as low cost building materials[4] is increased. The presence of fiber improves the ductility of mix, tensile and flexural strengths of mix, fracture roughness. Natural rubber latex is used for the treatment of coir fiber.

Methodology

The binder in geo-polymer concrete is fly-ash. Fly-ash binds the coarse aggregate, fine aggregate to form geo-polymerization[5]. Coir dust and pith is to be separated from coir fiber and 25mm of length to be considered. The chopped coir fiber is soaked in solution which is prepared by combination of water and sodium hydroxide. For the preparation of soaking solution for one liter of water we have added sodium hydroxide of 5%. This soaking is allowed for 48 hours so that the coir fiber is to mercerization[10]. After 48hrs coir fiber is washed repeatedly with distilled water and allowed to dry for 24hrs. Now the coir is soaked in latex compound which is combination of 70% of rubber latex, 10% of NaOH solution and 20% of distilled water for 15min and dried for 24hrs. In this research 20% of metakaolin is added to the amount of powder content for the purpose of one day setting only not for strength parameters.

2.1. SOURCE MATERIALS

1.1.1. Fly ash: The combustion of ground or powdered coal which results the residue of finely divided particle is known as fly ash. The combination of oxides of Calcium (CaO), Aluminum (Al2O3), Silicon (SiO2), and Iron (Fe2O3), are the chemical compositions, where the percentage of Titanium, Sodium, and Magnesium, Potassium, Sulphur are present in lesser amount. Fly ash is preferred is Low-calcium (ASTM Class F) as shown in Figure 1.

Figure 1 FLYASH

2.1.2. Alkaline Liquids: For geo-polymerizationthe mixture of NaOH and Na2SiO3 is used. In polymerization process alkaline liquid plays a key role. To prepare NaOH concentration either flakes or pellets are allowed to dissolve in water. For 12M, to prepare NaOH concentration, 12x40 = 480 grams of flakes per liter of the solution, where 40 is the molecular weight of NaOH.

2.1.3. Coarse aggregates: The coarse aggregate 10 mm was used for this experimental work which is locally available.

2.1.4. Fine aggregates: The locally available river sand, passing through 4.75 mm was used in this experimental work.

2.1.5. Coconut Fiber

Coirfibre has the potential to because reinforcement in internal wall paneling[7] system with binder component of cement and gypsum. Coirfibre is extracted from coconut outer shell. Coir fiber is chopped of 25mm as shown in Figure 2. and various percentages of 0%, 0.75%, 1.5%, 2.25%, 3% is used for this research.

Figure 2 COIR FIBER

2.1.6. Metakaolin: The Metakaolin is used for the investigation. The particle size of the metakaolin was referred with the help of scanning electron microscope. In powder content 20% is used as metakaolin for the setting purpose only.

2.1.7. Latex Rubber: Latexis a polymer of micro particles in an aqueous medium. It is either in natural or in synthetic form. Latex in nature is milky fluid as shown in Figure 3. Latex consists tannins, sugars, gums, alkaloids, oils, proteins, resins, and starches that coagulate on exposure to air. Naturally available latex is white, but in some plants latex is scarlet latex, orange or yellow.

Figure 3 LATEX LIQUID

2.2. COMPOSITE PREPARATION

The coir fiber is chopped to 25mm. The chopped fibers are allowed to soak in sodium hydroxide for 48hours for chemical treatment. After 48hours the treated coir fibre is washed repeatedly and allowed to dry for 24 hours. The dried fibres are then resin with latex compound the combination of 70% of latex, 10% of sodium hydroxide solution and 20% of water to achieve thee homogenization and allowed to dip for 15 minutes and dried for 24 hours.
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Polymerization is formed by the mixing of Na2SiO3 and NaOH. Sodium hydroxide is in the form of pellets or flakes. To form 12M, the sodium hydroxide flakes of 480 gms are dissolved in water to require the concentration. During the formation of concentration it liberates large amount of heat. To form polymerization the mixed sodium silicate and sodium hydroxide are allowed to keep at room temperature for minimum of 24hrs. This mixed solution acts as a binding agent.

2.3. MIXING, CASTING AND CURING

The Na2SiO3 and NaOHare mixed one day before to get polymerization which is perfectly suitable as the binding agent. All the materials are mixed manually. Fly ash and aggregate are mixed for one minute and the binding agent is added with small amounts and the mixing is done for 2minutes. Now the treated fibres are added to the mixture with the slow increment and mixing is done thoroughly. For compressive test cube specimens of 150x150x150mm, for split tensile test[9] cylindrical specimens of 150mm dia and 300mm height specimen and for flexural strength beam specimens 100x100x500mm^3 were casted. Curing is done under ambient conditions[8].

RESULTS AND DISCUSSIONS

3.1. COMPRESSIVE TEST

The Figure 4. shows that the strength of the specimen increases upto a level and then the strength falls down. For 7 days the maximum strength obtained is 7.3 N/mm^2. For 14 days 9.45 N/mm^{2}and for 28 days 10.58 N/mm^{2}are the maximum strengths obtained. This shows that optimum percentage of coir fiber is 2.25 for all.

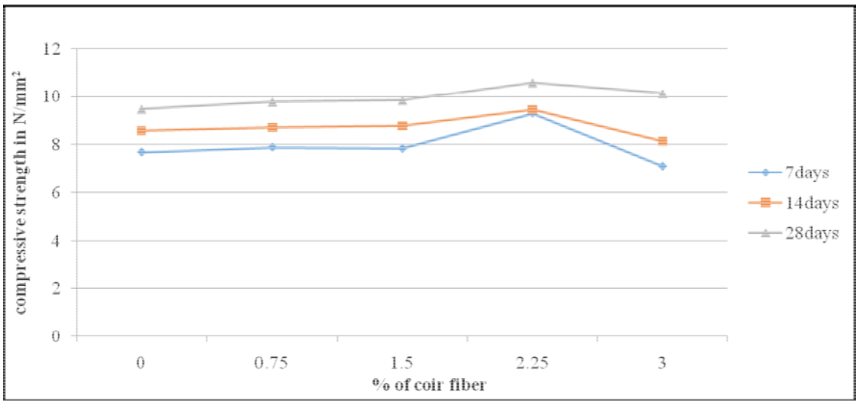

Figure 4 Compressive strength

3.2. SPLIT TENSILE TEST

The Figure 5. shows that the strength of the specimen increases up to a level and then the strength falls down. For 7 days the maximum strength obtained is 0.378 N/mm^2. For 14 days 0.41 N/mm^2 and for 28 days 0.48 N/mm^{2}are the maximum strengths obtained. This shows that optimum percentage of coir fiber is 2.25 for all.

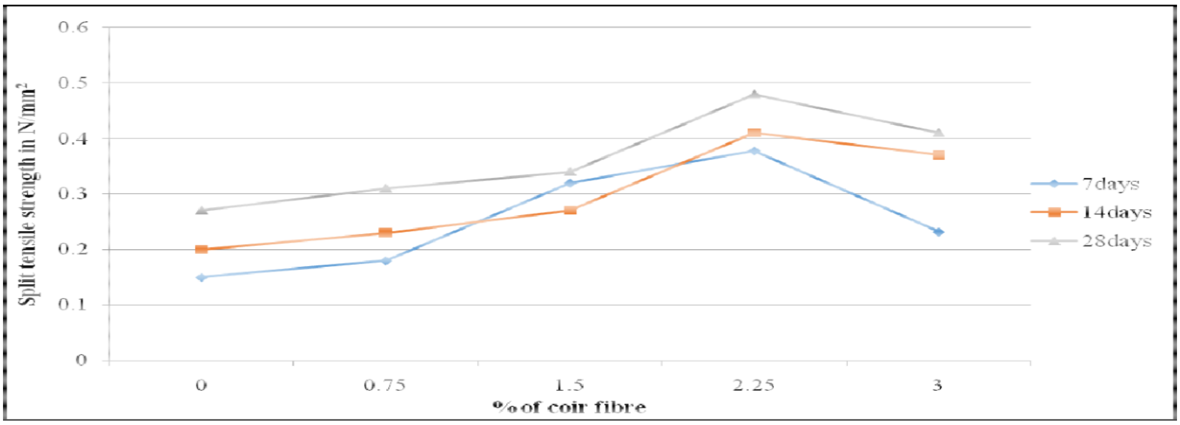

Figure 5 Split tensile strength

3.3. FLEXURAL STRENGHT

The Figure 6. shows that the strength of the specimen increases up to a level and then the strength falls down. For 7 days the maximum strength obtained is 1.76 N/mm^2. For 14 days 2.26 N/mm^{2}and for 28 days 2.93 N/mm^2 are the maximum strengths obtained. This shows that optimum percentage of coir fiber is 2.25 for all.

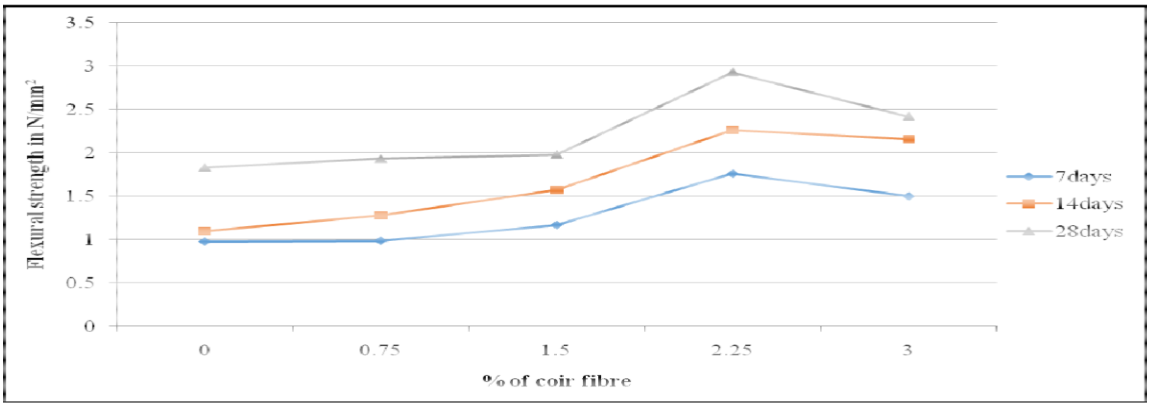

Figure 6 Flexural strength

CONCLUSIONS

1. The propagation micro cracks are resisted.
2. Optimum percentage of coir fiber is 2.25 in this research.
3. Increase in coir fiber percentage the strength parameters are also increase up to optimum and then strength decreases.
4. For 28 days 2.25% of coir fiber the compressive strength is 11.65% more comparing to 0% of coir fiber.

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5. For 28 days 2.25% of coir fiber the split tensile strength is 41.65% more comparing to 0% of coir fiber.
6. For 28 days 2.25% of coir fiber the flexural strength is 37.9% more comparing to 0% of coir fiber.

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