Combined Use of Human Hair and Use Waste Tyre Crumbs as Environmental Friendly Material in Cement Concrete

Asma Noorain, Student, M.Tech Scholar & India,asmanoorain213@gmail.com

Er. Anuj Sachar,Assistant Professor, Rimt University & India, anuj.sachar@rimt.ac.in

Er Muntazir Ahmad Bhat , Assistant professor, India, bhatmuntazir33@gmail.com

Abstract The comparative analysis of the experimental results of the combined use of Rubber tyre crumps and human hair as an ecofriendly material in recycled aggregate with different ratios of Rubber tyre crumps and human hair @ 1.5% are presented during this thesis. Recycled aggregate was made by crushing the waste concrete of laboratory test cube and precast concrete columns. Since the traditional times, many researchers and advancements were carried to boost the physical and mechanical properties of concrete. Fibre concrete is one in all those advancements which offers a standard practical and economical method for overcoming micro cracks and similar kind of deficiencies. Since concrete is weak in tension hence some measures must be adapted to over this deficiency .Human hair fibre is another non degradable matter available in abundance and is affordable cost. It also reduces environmental problems also addition of human hair combined with tyre crumps enhances the building properties, micro cracking control imparts ductility and also increases swelling resistance. Reuse of recycled or waste materials for the development of civil structures is a difficulty of great importance during this century. Addition of waste products in Fibre-reinforced concrete is additionally quite common now days.

Keywords —Human Hair, Tyre Rubber, Fibre

I. INTRODUCTION

Concrete could be a mixture of cement, water and aggregate and sometimes admixtures in required proportion. The mixture when placed in forms and allowed to cure hardens into a rock-like mass called concrete. The mixture consists of a combination of varied sizes of gravel and sand. When water is added to cement, a chemical change takes place causing the combo to harden. Cement is basically made of a combination of limestone and clay, which is ground into a awfully fine powder then burnt at a warm temperature in an exceedingly rotating kiln, thereby fusing it into a fabric called clinker. The clinker is cooled down and ground into a fine powder. Gypsum and various additives are then added to the cement. Concrete is comparable in composition to mortar, which is employed as a bonding material in masonry works. Mortars are however normally made using sand because the sole aggregate, whereas concrete contains a substantial amount of larger size aggregate. Cement is that the most expensive of the ingredients required supplying concrete.

Properties of Materials

CEMENT.

Most commonly used cement is termed hydraulic cement patented in 1824 in England. The essential raw materials employed in the manufacture of cement are carbonate found in lime stone or chalk, and silica, alumina and iron oxide found in clay or shale. The word "cement" is often traced back to the roman term opus cementitious, want to describe masonry resembling modern concrete that was made of gravel with calcined lime as binder. The volcanic ash and pulverized brick supplements that were added to the calcined lime to get a hydraulic binder were later said as cementum, cementum, cement, and cement. In present, organic polymers are sometimes used as cements in concrete. In present day concrete, cement may be a mixture of lime stone and clay heated in an exceedingly kiln to 1400 - 1600ºc. This amount represents about two minutes of output from a ten, 000 ton per day cement kiln. Hydraulic cement is that the most typical style of cement generally usage. It's a basic ingredient of concrete, mortar and lots of plasters. British masonry worker Joseph Aspdin patented hydraulic cement in 1824.

 DOI : 10.35291/2454-9150.2022.0390

Table 1.1 Physical properties of cement

Sr. No.	Properties	Observations
	Bulk density	1450 kg/m^3
1	Specific gravity	3.15
2	Initial setting time	30 min
3	Final setting time	600 min
4	Standard Consistency	5-7%
5	Fineness (90 micron IS Sieve)	5%
6	28-days compressive strength	42.17Mpa

AGGREGATE.

The term "aggregate" refers to all or any those materials which don't undergo chemical transformation even although they contribute to the ultimate results of the structure being treated: stones, sand, and bricks. They form the reinforcing structure of the mortar, occupying approx. 65-70% of its total volume. Since their grain-size will affect the standard of the voids to be filled by the binder, it's important for the grain sizes of the combination and therefore the binder to differ so on guarantee a compact mass. During this way, the crystals of the binder are shorter and hence more resistant so shrinkage during drying is reduced to the minimum. Sand is that the most generally used variety of aggregate: natural if it comes from quarries, rivers, lakes or the ocean, and artificial if it's the results of the crushing of rocks or artificial products. Reckoning on its nature and on the kind of rock from which it originates, sand may have different grain sizes, and this may affect the standard of the mortars produced. For instance, the presence of impurities like soil, clay and fine dust reduces the binding power of the carbonate and hence the resistance of the mortar, and therefore the use of sea sand, thanks to the presence of chlorides, tends, over time, to guide to the emergence of salt efflorescence.

HUMAN HAIR FIBRE (HHF).

Use of HHF to strengthen structural properties of concrete, improve designs and performance of concrete could be a creative approach that has lasted to achieve importance within the world of concrete and modern constructions.Chemically, the composition of HHF is about 80% made from a protein referred to as keratin, which has upper grade of sulphur created from the aminoalkanoic acid cysteine, characteristics that distinguish it from other proteins. Keratin could be a laminated complex formed by different structures, which provides the hair a cylindrical structure, strength, flexibility, durability, and functionality. Furthermore, most of hair fibres are keratinised and distributed following a awfully precise and pre- defined module .Hair forms a awfully tough structure within the molecular level having the flexibility to produce the thread both flexibility and mechanical resistance

Table 1.2 Properties of Human Hair

Property	Value
Ultimate tesile strain	**50.2%**
Hair diameter	95-130
Hair length	70mm
Aspect ratio	550-850
Tensile strength of Human hair	390Mpa

II. CONCLUSION

The following are the results that are drawn out from the experimental study. it's seen that there's increase still as decrease in properties of Rubber by weight of coarse aggregate @ 1.5% hair fixed.The reason for the decrease within the strength of concrete when rubber was used is because the follows.

- Lack of proper bonding between rubber particles and therefore the cement paste.
- When aggregate was replaced by rubber the burden was reduced.
- Heavy presence of rubber particles at the highest layer of specimen thanks to the lower relative density of the rubber particles.
- Non uniform distribution of rubber particles within the concrete, on homogenous samples are produced which ends in decrease in strength.
- Stiffness of rubber is lower as compared to stiffness of coarse aggregate; the presence of rubber in concrete reduces the mass stiffness of the combo leading to lowering the load bearing capacity of concrete.
- When M-40concrete is mixed with 3% of rubber @ 1.5% hair fixed is compared with plain cement concrete

REFERENCES

[1] A.S.Balaji1 and D.Mohan Kumar2, "Laboratory Investigation of Partial Replacement of Coarse Aggregate by Plastic Chips and Cement by Human Hair" (2014).

[2] Avinashkumar, B.Tech Final year student, "A study on mechanical properties of Hair fibre reinforced Epoxy composites" (May'2014).

 DOI : 10.35291/2454-9150.2022.0390

[3] B.W. et al, Characteristics of cement mortar withnano-SiO2 particles, Construction and Building Materials, Article.

[4] Darsh belani, prof.jayeshkumar pitroda& Dr. F.S umrigar" use of human hair as fiber for fly sah bricks (2013).

[5] D. Senthilnathan, a GnanavelBabu, G. B. Bhaskar, KGS. Gopinath, "Characterization of fibre – Coconut Coir– Human Hair Hybrid Composites", (2014).

[6] Dr.SinanAbdulkhaleqYaseen, "An Experimental Investigation into the Mechanical Properties of recent fiber Reinforced Mortar" (2013).

[7] Eldin, N.N., Senouci, a. b., Rubber-tire particles as concrete aggregate, ASCE journal of materials in engineering, vol. 4, pp. 478-496, 1993.

[8] F. Pacheco Torgal, A. Shasavandi, S. Jalali, "Tyre rubber based concrete: A Review" WASTES: Solutions, Treatments and Opportunities 1St International Conference September 12th – 14th 2011.

[9] Gregory GRRICK, 2004. Analysis of waste tire modified concrete. In: 2004 ME postgraduate Conference, Louisiana State University .

[10] Tomas U. Ganiron Jr. Australian Institute of Geoscientists, "Effects of Human Hair Additives in Compressive Strength of Asphalt Cement Mixture" (2014).

 DOI : 10.35291/2454-9150.2022.0390