To Study Engineering Properties of Ultra Light Weight Foam Concrete Using Hydrogen Peroxide

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Abstract- *Due to desirable thermal insulation properties, superior fire-resistant and high durability, ultra light weight foam concretes are recommended to achieve energy efficiency in building. Generally aluminates cement, sulphoaluminate cement and other quick hardening cementious materials are used to control the stability of air-void in foam concretes. In the present research the proportioning and properties of Portland cement based ultra light weight foam concrete were investigated. The result show that ultra light weight foam concrete with apparent density of 100-300 kg/m3 can be prepared using portland cement, fly-ash, hydrogen peroxide and polypropylene fiber and check compressive strength*.

Keywords- foam concrete, hydrogen peroxide, Portland cement, compressive strength.

I. INTRODUCTION

Light weight foamed concrete has become more popular in recent year. Modern technology and a better understanding of the concrete have also helped much in proportion use of light weight foamed concrete. This chapter describe the composition and properties and how it is use in civil engineering works. Because the properties of foamed concrete can vary widely and it can be used in wide variety of applications, it is important to define performance requirement for each case.

Foam concrete are manufactured by adding foaming agent into cement paste or cement mortar. The key of preparation process is the matching of foaming process and hardening process of foam concrete, thus aluminates cement, sulphoaluminate cement and other quick hardening cementious material are generally used to control stability of bubbles in foam concrete. However these foam concrete present poor durability and high cost, and availability of special cement is relatively difficult, all of which lead to limitations in the application and popularization of foam concrete. In addition many investigation have been conducted on the composition, physical properties and application of foam concrete with density 600-1500 kg/m3 .while few studies have been done on composition and properties of ultra lightweight foam concrete (<300 kg/m3).

In this research, ultra lightweight foam concrete was prepared using Portland cement, fly-ash, hydrogen peroxide. Factors influencing the properties of ultra lightweight foam concrete were investigated. and the relation between compressive strength, and apparent density of foam concrete were evaluated. The result will be very useful to the preparation and application of Portland cement based ultra light weight foam concrete and thus to energy efficiency buildings.

The use of lightweight foamed concrete offer many benefits and advantageous particularly cost saving, fast completion and easy application compared to other materials such as steel and timber. Light weight foamed concrete is characterized by its low compressive strength and high insulation against heat and sound.

II. MATERIAL PROPERTIES

1) FLY ASH**:** The use of fly ash as partial replacement of cement in concrete is a common practice for many decades. During 2010–2012, the utilization of fly ash for construction application has achieved approximately 55% and become a commercial product which is the utilization of high volume fly ash in concrete addresses the challenges of sustainable construction. Chemically, fly ash has pozzolainic activity which is attributed to the presence of SiO_2 and Al_2O_3. It reacts with calcium hydroxide (C-H) during cement hydration, to form additional calcium silicate hydrate(C-S-H) and calcium alluminate hydrate (C-A-H) which are effective in forming denser matrix leading to higher strength and better durability.

TABLE.1 .Properties of Fly Ash

Chemical Analysis	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	MnO	K_2O	Na_2O	TiO_2	SO_3
Content (%)	51.80	26.40	13.20	1.61	1.17	0.10	0.68	0.31	1.44	0.21
Physical Properties	Particle Size	Specific Gravity	Los on Ignition(%)	-	-	-	-	-	-	-
Content (%)	40 % of 10 µm	**2.6**	**0.5**	-	-	-	-	-	-	-

2)HYDROGEN PEROXIDE: Hydrogen peroxide is a clear,colourless,non-flammable liquid,it has a slighty pungent odour.hydrogen peroxide is a versatile chemical with a wide variety of appplication.it is commercially available as aqueous solution various concentration and gradesthe minute voids and pores in the microstructure .In these study I uses a nano CaCo3 And Nano Fe2O3.

TABLE.2 Properties of Hydrogen peroxide

Properties	Value
Melting point	-0.41 celcius
Boiling point	150.2 celcius
Density	1.4425gram/cube centimeter
Viscosity	1.245Cp
Specific heat	2.628 J/g

3) CEMENT: The cement used in all mixtures is commercially available ordinary Portland cement of 53 grade confirming to IS 12269:1987 is used in this study. Cement is a fine, grey powder. Cement is mixed with water and materials such as sand, gravel, and crushed stone to make concrete. The cement and water form a paste that binds the other materials together as the concrete hardens. The choice of the type of cement depends upon the requirements of performance at hand. The most commonly used cement is called ordinary Portland cement. Variation in the cement quality will cause the concrete compressive strength to vary more than any other single material. Ordinary Portland cement of different grades OPC-33, OPC-43 and OPC-53 are available in the market and are generally used for producing fly ash fiber reinforced concrete. The cement was of uniform color i.e. Grey with a light greenish shade and was free from any hard lump.

TABLE.3 Properties of cement

Constituent	Volume (%)
SiO_2	20.70
CaO	64
Al_2O_3	5.75
Fe_2O_3	2.50
MgO	1.00
LOI	1.05

4) POLYPROPYLINE FIBRE: Although type of fiber has been tried out in cement and concrete, not all of them can be effectively economically used. each type of fiber has its characteristic properties and limitation. some of the fiber that could be used are steel fiber, polypropylene fibre ,nylon fiber, asbestos, coir, glass, and carbon. Fiber is small piece of reinforcing material possessing certain characteristic properties. they can be circular or flat. the fiber is often described by a convenient parameter called aspect ratio. the aspect ratio of the fiber is the ratio of its length to its diameter. Typical aspect ratio rating from 30 to 150.polypropylyne fiber is found to be suitable to increase the impact strength. they posses very high tensile strength. but their low modulus of elasticity and higher elongation do not contribute the flexural strength..

TABLE.4 properties of polypropyline fibre

Moisture regin	<0.1%
Refractive index	1.49
Thermal conductivity	0.95Btu-in/ft2.hr.oF
Cofficient thermal expansion	4.0x10-5 /Of
Heat of fusion	21cal/g
Specific heat	0.46cal/g.c
Density of melt at 1800	0.769g/cc
Heat of combusion	19400Btu/lb
Oxygen index	17.4
Decomosite temperature range	328-410Oc
Dielectric constant	2.25
Dissipation factor	<0.0002
Specific volume	>1016W.Cm

5) WATER: The water used in the manufacturing of concrete is portable water. water is needed for hydration of cement and molding of concrete to the desired shape. The relationship between compressive strength and water to cement ratio is well established. An increase in water to cement ratio leads to a reduction in compressive strength.

III. EXPERIMENTAL RESULTS

A, COMPRESSIVE STRENGTH TEST: The cube specimen size of 150mm×150mm×150mm are casted..The cube are casted for the results of 7 and 28 days. following are the cube ID for the compressive strength test of the different proportion of the hydrogen peroxide, fly-ash, And polypropylene fiber.

TABLE.5 Cube ID of different cube specimen

CUBE ID	H_2O_2(%)	FLY-ASH(%)	POLYPROPILINE FIBRE (%)
A1	3.50	18.25	0.20
A2	3.55	18.25	0.20
A3	3.60	18.25	0.20
A4	3.65	18.25	0.20
A5	3.70	18.25	0.20
A6	3.75	18.25	0.20
A7	3.05	18.75	0.20
A8	3.90	18.50	0.20
A9	3.95	18.50	0.20
A10	4.00	18.50	0.20

1) COMPRESSIVE STRENGTH TEST AND DENSITY RESULT OF HYDROGEN PEROXIDE, FLY-ASH,POLYPROPYLINE FIBRE CONTAINNING CONCRETE.

TABLE.6 Compressive Strength and density of Concrete

CUBE ID	DENSITY(kg/m3)	7days Compressive Strength (Mpa)
A1	256.26	1.11
A2	256.99	1.10
A3	266.52	1.28
A4	255.59	1.42
A5	255.59	1.45
A6	277.09	1.73
A7	285.26	1.86
A8	223.66	1.11
A9	199.27	1.05
A10	156.39	0.93

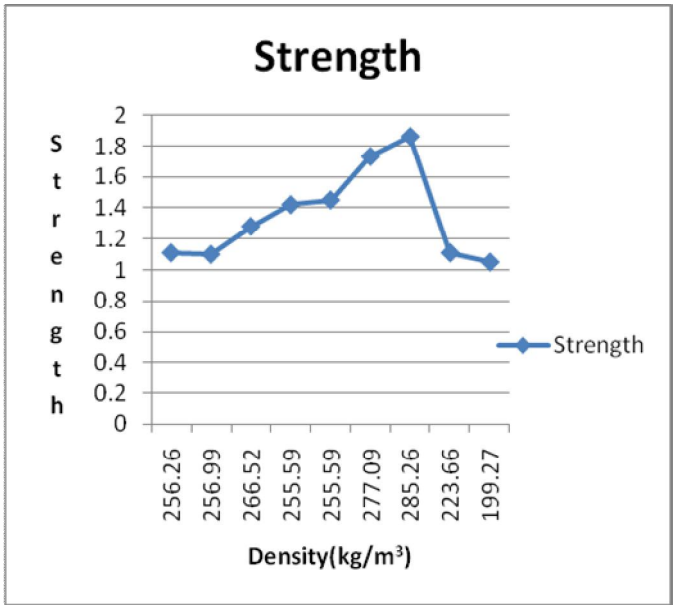

Fig.1 Density vs Strength graph (7 day)

TABLE.7 Compressive Strength and density of Concrete

CUBE ID	DENSITY(kg/m3)	28days Compressive Strength (Mpa)
A1	253.99	1.26
A2	260.06	1.35
A3	267.69	1.73
A4	256.52	1.53
A5	256.40	1.52
A6	282.06	1.83
A7	289.05	1.96
A8	227.63	1.35
A9	205.66	1.17
A10	159.33	1.00

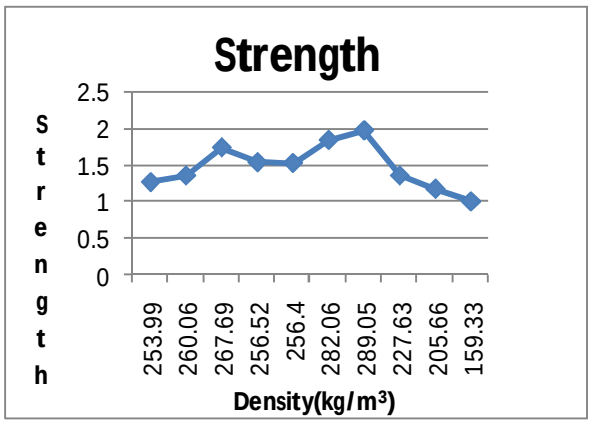

Fig.2 Density vs Strength graph (28 day)

Fig.3 7 and 28 day compressive strength

Fig.4 7 and 28 day density

IV. CONCLUSION

In this study the effect of H_2O_2 fly ash are study and the crack resistant polypropylene fiber. According to these study to determined the optimum % compressive strength and apparent density measured as compared to normal light weight concrete.

A. We concluded that the maximum compressive strength are occur at the 3.05 % H_2O_2 ,18.75 % fly ash and polypropylene fiber 0.20%. The compressive strength is 1.96 MPa at 28 days.
B. We concluded that find apparent density is foamed concrete (300kg/m^3).
C. We study the improvement of crack resistance foam concrete.

V. ACKNOWLEDGEMENT

I would like to articulate my profound gratitude and indebtedness to my project guides Prof. Dr, D.J.VARIYA and Prof, H.B.PATEL Who have always been a constant motivation and guiding factor throughout the project time in and out as well. It has been a great pleasure for me to get an opportunity to work under them and complete the project successfully.

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