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Review on 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/m^3 can be prepared using portl and cement, fly-ash, hydrogen peroxide and polypropylene fiber and check compressive strength, water absorption and permeability test.
Keywords*: *Foam concrete, hydrogen peroxide, Portland cement, compressive strength, water absorption, permeability test

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/m^3 .while few studies have been done on composition and properties of ultra lightweight foam concrete (<300 kg/m^3), which show superior thermal insulation properties than the former.

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, water absorption, permeability test 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. LITERATURE REVIEW

A. [*1]V.Ducman L. Korat,2016 Investigated the "Characterization of Geoppolymer Fly-Ash Based Foams Obtained With The Addition Aluminium Powder or Hydrogen Peroxide as Foaming Agent"*. This paper study both foaming additive aluminium powder and hydrogen peroxide proved to be successful foaming agent for the investigated geopolymer matrix. the addition of aluminium powder amounting between 0.007 and 0.2% mass resulted in a porous structure having density of between 0.64 and 0.74 g/cm3.the measured compressive strength of the test sampled were within the range of 3.3 to 4.3Mpa for those which

aluminium powder added within the range of 2.9 to 9.3 MPa. When hydrogen peroxide added as expected the measured compressive strength were in correlation strength and density the higher density and compressive strength.

B. *[2] j.sathya narayanan, k. Ramamurthy 2012 investigated "identification of set-Accelerator for Enhancing the Productivity of Foam Concrete block manufacture"*. The experimental results indicate that by using of set-acceleration in the process of demoulding could be facilitated by reducing cycle time; the block production rate can be increased by reusing a reasonable number of moulds. Hence there is a need to identify suitable accelerator and its dosage which would reduce the setting time of foam concrete thereby facilitating early demoulding. Extensive research has been carried out on the use of set-accelerators in normal concrete. Calcium chloride, calcium nitrate (cn), triethanolamine (tea), lithium salts, calcium format are use as acceleration.

C. *[3]Pan Zhihua Li Hengzhi,Liu Weiqing 2014 investigated'' Preparation and characterization of super low density foamed concrete from portland cement and admixtures"*. In This Research paper Conventional Portland cement was selected as the main binding material instead of rapid hardening special cement such as sulphoaluminate cement. Chemical and physical admixtures were properly introduced for the regulation of the rheological property and hardening speed of the fresh cement mixture slurry as well as the physical properties of the hardened foamed concrete. The resultant foamed concrete with its curing age of 28 d thus obtained presents its compressive strength between 0.33 MPa and 1.1 MPa, water absorption between 6.6% and 8.3% and thermal conductivity between 0.05 W/mK and 0.07 W/mK

D. 4] *Kwang-Soo Youm, Jiho Moon, Jae-Young Cho,Jung J.Kim, 2016 investigated ''Experimental study on strength and durability of lightweight aggregate concrete containing silica fume''*. In this study the mechnicle property and durability performance of high strength light weight aggregate concrete with silica fume for 91 days were presented, the compressive strength of 60 Mpa at 28 days and oven dry density below 1900kgm3.nine mixture with three aggregate type and silica fume replacement ratio 0%,3,5%,and 7% by cement weight were prepared. the tensile strength the compressive strength and modulus elasticity test were conducted 7 days,28days,56days,and 91 days.

E. *[5] Jing Lv, Tianhua Zhou, Qing Du, Hanheng Wu, 2015 investigated''Effect of rubber particles on mechanical properties of lightweight aggregate concrete"*. Based on the findings of this study, the addition of rubber particles can decrease the slump value of lightweight aggregate concrete. The dry unit weight of hardened rubberized lightweight aggregate concrete decreases with the increasing replacement level. Significant reduction in compressive strength, flexural strength and splitting tensile strength was recorded in mixtures containing rubber particles. The most reduction of strength occurs when the replacement ratio was lower than 50%.The reduction in static modulus of elasticity indicates higher flexibility, which can be viewed as a positive gain in rubberized lightweight aggregate concrete mixtures. The normal strength lightweight aggregate concrete applications containing rubber particles could be produced and it can be used in no primary structures, such as building exterior wall, partition walls, sidewalks, crash barriers and paving, etc.

Table : 1 Experimental result(Jing Lv,Tianhua Zhou, Qing Du,Hanheng Wu, 2015)

Type of concrete	Compressive strength (MPa)			Splitting tensile strength (MPa)			Flexural strength (MPa)			Static modulus of elasticity (GPa)			Unit weigt
	1d	7d	28d	1d	7d	28d	1d	7d	28d	1d	7d	28d	28d
1	13.4	30.9	41.5	1.22	3.11	4.38	1.32	3.35	4.68	5.6	16.8	24.1	1820
2	12.1	27.4	39.2	1.14	2.94	3.85	1.24	3.17	4.44	4.7	14.6	22.5	1780
3	10.7	25.1	36.4	1.09	2.77	3.67	1.11	2.92	4.05	4.1	13.7	20.4	1714
4	9.4	20.6	29.5	0.98	2.31	2.93	1.02	2.54	3.57	3.5	13.1	18.5	1650
5	7.3	16.8	22.8	0.79	1.87	2.51	0.83	2.26	3.24	3.1	12.7	16.1	1607
6	5.1	11.5	16.6	0.61	1.52	1.93	0.69	1.99	2.79	2.7	11.5	14.8	1533
7	4.4	9.4	13.3	0.49	1.21	1.52	0.53	1.78	2.33	2.5	9.1	12.3	1487

8	3.7	7.7	10.9	0.41	0.95	1.12	0.45	1.45	1.81	2.4	8.7	9.8	1436
9	3.3	6.9	9.2	0.37	0.83	0.98	0.42	1.13	1.53	2.4	6.8	8.9	1339
10	3.0	6.3	8.2	0.33	0.72	0.87	0.38	0.97	1.08	2.3	5.6	7.7	1366

F. *[6] Javad Torkman, Alireza Ashori, Ali Sadr Momtazi, 2014 investigated "Using waste fiber waste, rice husk ash, and limestone powder waste as cement replacement materials for lightweight concrete blocks".* Based on this study partial replacement of Portland cement by wood fiber waste (WFW), rice husk ash (RHA), and limestone powder waste (LPW) for producing a lightweight concrete block The compressive strength of the concrete blocks due to the filler effect decreased with increasing cement replacement. However, the results show the effect of 25 wt% replacement of RHA and LPW with Portland cement do not exhibit a sudden brittle fracture even beyond the failure loads, indicates high energy absorption capacity, reduce the unit weight dramatically. As expected, the increase of the RHA content induced the reduction of bulk density of the concrete blocks. Statistical analysis showed that the interactions of above-mentioned variable parameters were significant on both mechanical and physical properties at5% confidence level. The optimum replacement level of WFW, LPW, and RHA was 25% by weight; thisre placement percentage resulted in good physic mechanical properties.

G. *[7] E. P. Kearsley, P.J.Wainwright, 2001 investigated ''Porosity and permeability of foamed concrete".*Based on this study Replacing large volume of cement (up to 75%by weight) with both classified and unclassified fly ash this paper reports only on the results of permeability and porosity measured up to an age of 1 year on well-curved concretes. Porosity was found to be dependent mainly on the dry density of the concrete and not on ash absorbed by foamed concrete was approximately twice that of an equivalent cement paste but was independent of volume of air entrained, ash type or ash content.

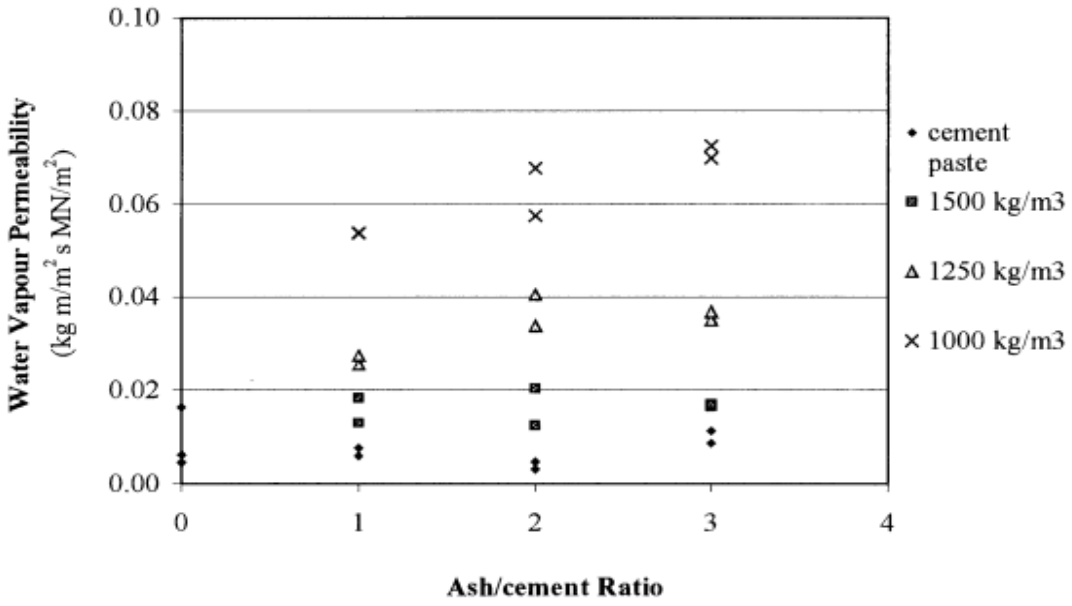

Fig 1 Effect of Ash/cement Ratio on water vapour permeability(E.P. Kearsley, P.J.Wainwright, 2001*)*

H. *[8] L.Gunduz, 2008 investigated ''Use of quartet blends containing fly ash, scoria, perlitic pumice and cement to produce cellular hollow lightweight masonry blocks for non-load bearing walls".* The research findings show that higher the amount of fly ash in the mixture, lesser the dry density of Cellular hollow lightweight masonry (CHLM)blocks. Mixture batches of 5% OPC content for 50%fine scoria aggregate (FSA) + 50%Perlitic pumice aggregates (PPA)and 30% FSA + 70% PPA by volume could not be used in producing CHLM blocks due to their insufficient strength. Eight percentage OPC, the compressive strength of blocks increases for use of fly ash up to between 11%and 12% of cement contents as a mineral admixture for different mixture batches. However, use of fly ash more than12% of cement content causes the strength reduction for CHLM blocks due to the insufficient water amount in the mixture for hydration reaction. It was also observed that reduce in W/C ratio results in increase of the compressive strength of CHLM blocks. Within the 6/1 to 16/1 range of A/C ratios, ovens dry densities between

595 and 980 kg/m3and compressive strength values between 1.33 and 4.52 N/mm2can be achieved dependant on mixture proportions. Water absorption of CHLM blocks, in the present investigation was obtained to be between 18.48% and 40.92%. The weights of various designated hollow blocks are found tube 15–35% lesser compared to normal weight hollow blocks.

I. [9] *Nagesh. Mustapure, H.Eramma,2014 investigated ''Experiment investigation on cellular lightweight concrete blocks for varying grades of density''*. This study has shown that the use of fly ash in foamed concrete, either can greatly improve its properties. Most of the cleaner production effort is required in India and hence CLC blocks may be used for construction Purpose, which is advantageous in terms of general construction properties as well as eco-friendliness. By change of density of 800 kg/m3 to 1100 kg/m2 the strength of blocks will be increasing by 2.6 N/mm2 to 5.4 N /mm2 show the graph.

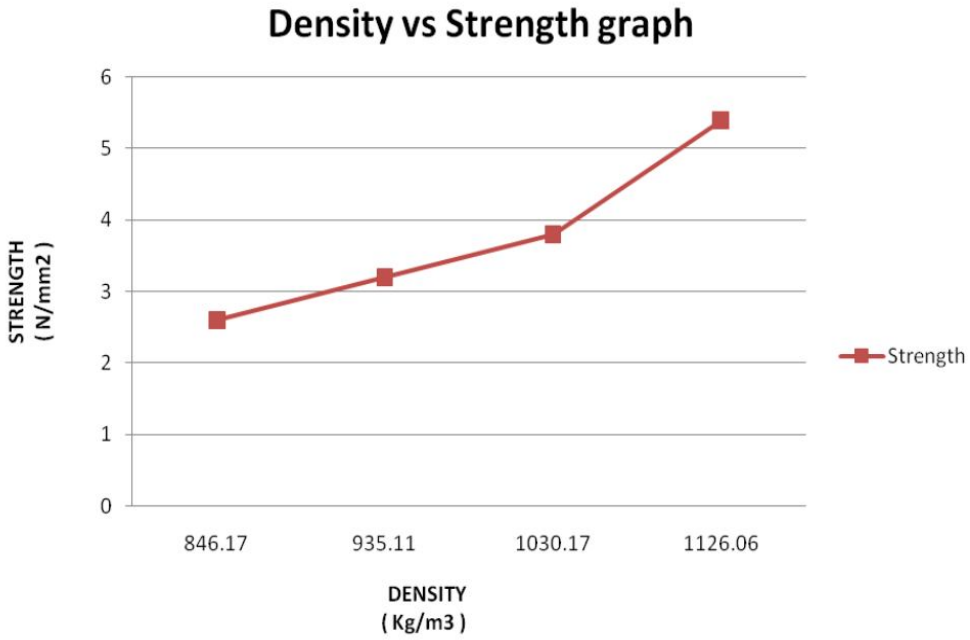

Fig 2 Effect of density on strength(Nagesh.Mustapure,H.Eramma,2014)

J. *[10] Payam Shafigh, Johnson Alengaram, Hilmi Bin Mahmud, Mohd Zamin Jumaat 2013 investigated " Engineering properties of oil palm shell light weight concrete containing fly ash"* This paper study cement replacement with type fly ash 0%,10% ,30% and 50% on some engineering properties an oil palm shell high strength, tensile strength, flexural strength water absorption and drying shrinkage. the effect of initial water curing periods 2,4,and 6 days demoulding and air drying environment on the 28 days compressive strength was also investigated.

K. [11]*Michal Lach, Kinga korniejenko, Janusz Mikula, 2016 investigated ''Thermal insulation and thermally resistant material made of geopolymer foams''*. This paper study foamed geopolymer are promising to other foamed materials. the article present the methods of its production and the result of the research on such material product from the fly ash from CHP plant. it provides and analysis the strength and thermal conductivity of the expanded geopolymer foams .it also determine the relationship between the thermal conductivity and density of foamed geopolymers. The density of the obtained material ranged from approx 400kg/m3 to 650kg/m3.the research result the confirm that the foamed geopolymer produced from fly ash from CHP plant have reasonable mechanical properties and performance of a construction product. geopolymer are relatively new material whose specific properties find wider and wider application in various industry. in result of the foamed concrete can be a promising alternative to other foamed material. the research confirm that the foamed geopolymer product from fly ash from CHP plant have reasonable mechanical properties and performance of a construction product. it is possible to obtain foamed geopolymer whose density amount 200 to 400kg/m^3 by means proper mixing methods and adding more foaming agent. the result shows that the hydrogen peroxide is good foaming agent. it allows obtaining a homogeneous material structure. the amount of the hydrogen peroxide additive from 2% to 7% .the amount of has an influence on density and mechanical property. the higher amount of hydrogen peroxide caused lower material density and also lower compressive strength. the use of microstructure from fly ash allow reaching appropriate proportion of cells. in the material there are open as well as close cells. the presence of close cell give the material better insulating properties comparing with material only open cells

III. CONCLUSION

A. In Various Research they shows that a number of foaming agent were adding and check compressive strength and density.

B. Collapse and air voids escape can be avoided in the ultra light weight foam concrete by adding thickening agent and stabilizing imulsion.

C. In above paper we refer check split tensile strength and flexural strength using different types of materials.

D. In above research hydrogen peroxide were using 007% to 2% and decrease density of concrete and used in different types of light weight structures.

E. When the uses of hydrogen peroxide the appperant density is decrease.

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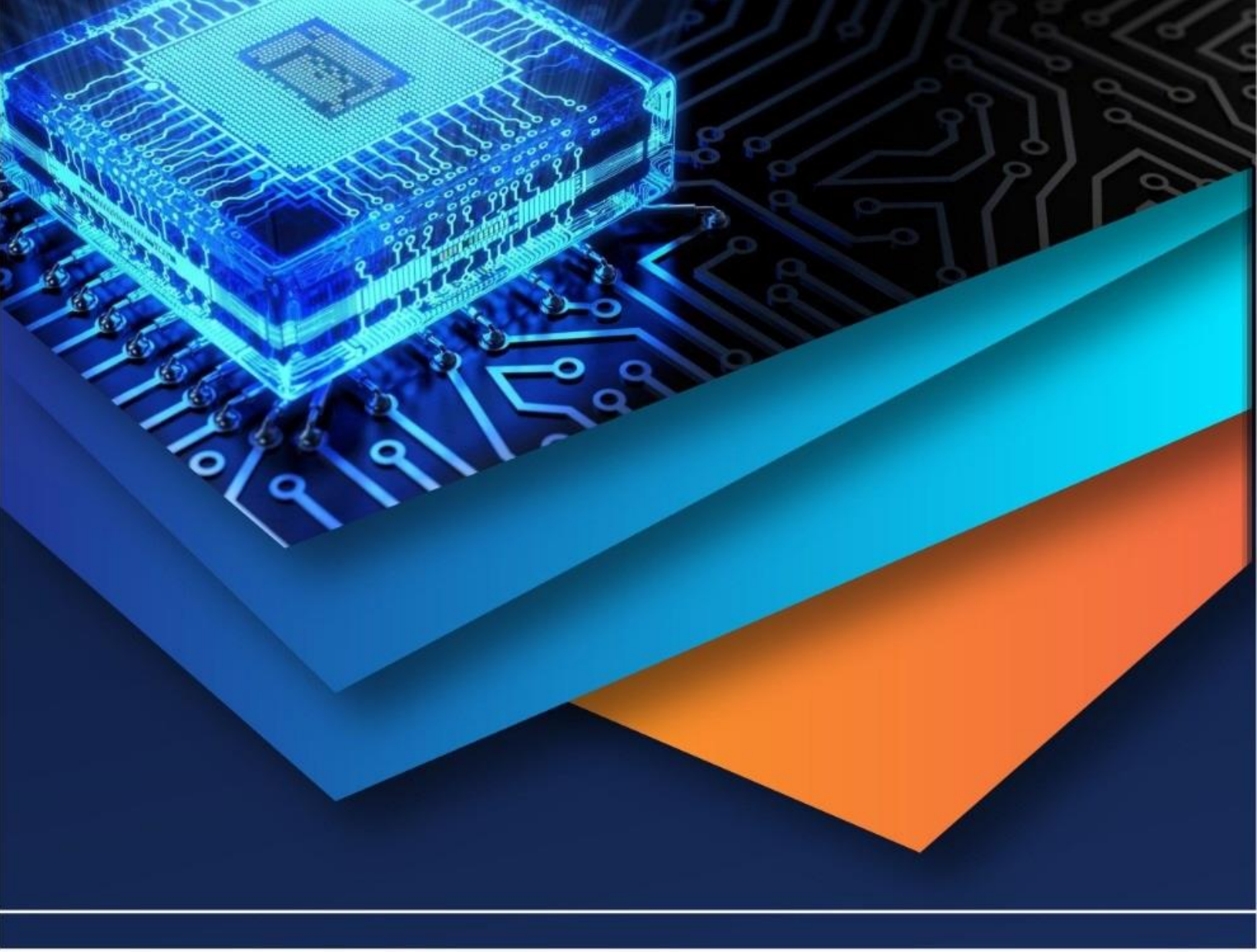

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