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A Review of FTIR and Thermal Resistance test of Cement Mortar made with Metakaolin and Flyash Partially Replaced in cement cured in sea water

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Abstract -– In this present study the strength and quality and thermal effect of the cement mortar having partially replaced metakaolin and flyash in cement by compressive strength and thermal resistance and Fourier Transform Infrared spectrum analysis (FTIR)were evaluated for all combination of the mixes of cement mortar.
Keywords: cement mortar, metakaolin ,flyash , Seawater,Thermal resistance ,FTIR.

I. INTRODUCTION

The metakaolin is produced by calcination of kaolin clay at temperature ranging from 700–850°C 00 The main oxides in the metakolin silica and alumina partial replacement cement with metakaolin can increase the mechanical and durability performance of cement based materials .Flyash is pozzalonic materials it is finely divided amorphous aluminum silicate with varying amount of calcium .The result of the flyash in the concrete strength infleced by its physical and chemical properties Fly ash used in concrete 15% to 25% by mass comentious component ,it include the oxide contents of silicon, aluminum, calcium. The sea water temperature and salinity are 0°C -120°Cand 0-120g/kg respectively The atmosphere pressure range 0-12Mpa The properties varies between pure water to salt water about 5% to 10% can have important effect in system level design the specific heat capacity and boiling point elevation are all whose variation affect the distillation system.

In the FTIR Analysis Infrared Radiation is passed through the sample some of the infrared radiation is absorbed by the sample and some of its passed through or transmitted The resulting spectrum represents the molecular absorption and transmission creating molecular fingerprint of the sample .identify the unknown materials and quality or consistency of the sample .and determine the amount of component of mixture In thermal analysis the specimen were put in to an electric furnace and heated upto 700 degree Celsius for two hours it can determine the strength loss of the specimen due to thermal effect by vary of its dry weight and saturated weight .In the compressive strength of the different mortar the control mix can have the higher compressive strength than the replaced metakaolin and fly ash cement mortar

II. LITERATURE REVIEW

Anupama P.S et al. [4 studied the strength of metakaolin modified cement motor with quarry dust as Fine aggregate The metakaolin in cement mortar as a partial replacement of cement where quarry dust was used as the fine aggregate . this paper describes that use of super pozzolanic supplementary cementing materials such as silica fume, rice husk ash, metakaolin etc in concrete and mortar improves the strength even at a higher water binder ratio. (a) The inclusion of metakaolin results in faster early age strength development of mortar. (b) Mix with 15% metakaolin is superior in all water/binder ratios investigated. (C) The increase in metakaolin content improves the compressive strength, irrespective of water binder ratio used.The effect of water binder ratio and metakaolin replacement level on the compressive strength of quarry dust mortar was investigated

Shan C Sabu Studied the effect of metakaolin on various properties of concrete The results that the compressive strength and elastic modulus decrease with increasing compressive strength grade of specimen. Studied the effect of the non ground matakaolin ,as fine aggregate in mortars on restraint shrinkage cracking and flexural and compressive strength.T he addition metakaolin in concrete considerably improves the strength and durapility properties .Metakaolin has very positive effect on the concrete strength after days and specifically at 28 days and 90 days .Metakaolin concrete exhibits significantly lower chloride permeability ,gas permeality and sorpitivity and pore size compare with OPC concrete .The optimum temperature for heating kaolin inorder to obtain metakaolin with higth pozzalanic index is still different from one reacher to another .The heating period also still exactly undetermined .Ternary mixture have promising future for implementation in the future bridge decks and pavement to delay chloride induced corrosion process.

yuksel .The replacement level of the fine aggregate with metakoliun were ranging from 10% to 100% with an increment of 10% it has concluded that the optimum ratios for use of non ground metakaolin mortars were 40 and 50% for flexural strength and compressive strength respectively .and possible usage of the metakaolin as sand replacement in production of the plain concrete elements .Compressive strength ,flexural strength ,free-thaw and surface abrasion resistance were studied sand was partially replaced at percentage level 20,30,40,50The result showed that the usage of partially fine aggregate of these materials had more beneficial effects on durability characteristics of plain concrete element.

Ismeil studied the compressive strength of concretes in which natural and sand was partially replace with metakaolin at levels of 5%,10%,15% by weight at different water cement ratios of 0.5,0.55and 0.6.The results showed that the there is improvement of 17% in the compressive strength with inclusion of metakaolin

Afafghasis (2014) Studied the performance of concrete with flyash and kaolin inclusion. The fly ash improves the concrete properties than kaolin .The fact is that the calcium and aluminium content in fly ash are higher than the in kaolin ,which enhances the pozzalona reactions when water is added to the flyash concrete mix The partial replacement of the cement used in concrete The replcement of 10% fly ash with cement improves the comprehensive strength of concrete in 28 days period,and workability is increased by 53.8% The kaolin replacement reduced both the strength and workability of concrete.

J.M Khatib (2012) studied that the high volume metakaolin as cement replacement in mortor.The conclusion that replacement cement with around 20% metakaolin causes a substantial enhancement in compressive strength of mortor. This enhancement in compressive strength can reach a value around 50% compared with the control .Beyond 30% metakaolin the compressive strength starts to reduce. However the maximum value of the ultrasonic pulse velocity occurs around 10% metakaolin.

F.Pacheco Torgal (2011) Studied using metakaolin to improve the compressive strength and the durability of flyash based concrete .This paper confirm that partial replacement of Portland cement by 30% fly ash leads to serious decrease in early age compressive strength when compared to are a reference mix of 100%portlandcement .The use of 15% fly ash and 15% metakaolin based mixture are responsible for minor strength loss but leads to an outstanding durability improvement. Flash /metakaolin mixtures have a low corrosion risk assessed in electric resistivity tests .

G.E.A Swann and S.V Patwardhan in this paper Application of Fourier Transform Infrared Spectroscopy for assessing the biogenic silica sample purity in geochemical analysis and palaeoenvironmental research. FTIR analysis of the three containment sample that make up the silt end member produce near identical spectra validating the approach here of combining the three sample to create a single silt containment end member FTIR suggest that improvement could be obtained through the identification and use of more refined end members for each sample .In the interim by assessing levels of the containment using both FTIR and XRF The potential limitation associated with each technique can be overcome to provide a better insight of sample contamination .

III. CONCLUSION

From reviewing the above research papers related to metakaolin and flyash relevant conclusions can be made:

A. In Fourier Transform Infrared Test the variation spectrum analysis are found also variation of mix gives the quality (purity)of the materials and component mixture and determine the unknown materials

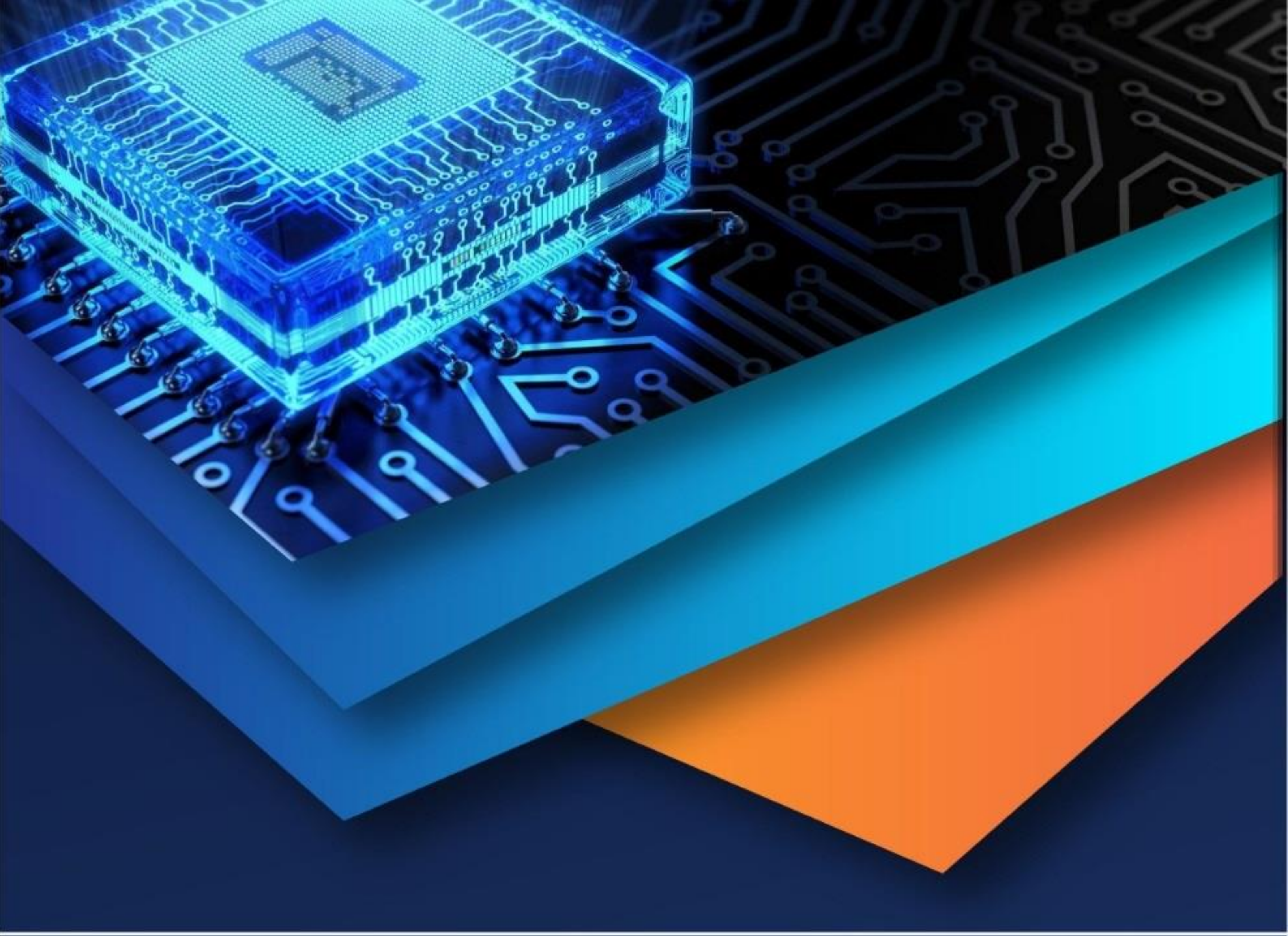
B. In compressive strength test compressive strength will be low for higher percentage of partially replaced of the metakaolin and fly ash in the cement and Cost of mortar production reduces when Metakaolin and Fly Ash are used as cement replacement in mortar

C. In thermal resistance anlaysis the thermal effect of the sample were analyzed higher replacement of the matakaolin and fly ash will have the strength and weigth loss

D. All Replacing cement with up to atleast 20% metakaolin causes increase in strength compared to the control mix. However, using more than 20% metakaolin as partial cement replacement does not cause further increase in strength compared with the other metakaolin mixes. The optimum replacement level that causes a maximum enhancement in compressive strength.

REFERENCES

[1] G.E.A Swann and S.V Patwardhan 2011 Februry " Fourier Transform Infrared Spectroscopy (FTIR) for assessing biogenic silica sample purity in geochemical analysis and research pal environmental research" published by Copernicus publication on behalf of the European Geosciences union
[2] J.M Kahatib and E.M Negim and Gjonbalaj publication 2012 world journal of chemistry "High volume Metakaolin as cement Replacement in Mortar"
[3] Venkata sairam kumar.N, Dr.B.Panduranga Rao, Krishna Sai.M.L.N, 2013,"Experimental study on partial replacement of cement with quarry dust". IJAERS, Vol:2(3),136-137.
[4] W.Sha, 2002, " Differential scanning calorimetry study of the hydration products in Portland cement pastes with metakaolin replacement". Advances in building technology, Proceedings of the international conference on advances in building technology,
[5] Jiping Bai, Stan Wild, Albinas Gailius, 2004, "Accelerating early strength development of concrete using metakaolin as an admixture". Material Science, Vol.10(4), 338-344.
[6] Hisham.M.Khater, 2010, "Influence of metakaolin on resistivity of cement mortar to magnesium chloride solution". Vol:54(4), 325-333.
[7] Chiaverini.J, 2004,"Metakaolin lime mortar, a replica of Genoese porcellana as a mortar for restoration". 2nd Swiss geosciences meeting, Lausanne.
[8] J.M.Khatib, E.M.Negim and E.Gjonbalaj, 2012, "High volume metakaolin as cement replacement in mortar". World journal of chemistry 7(1), 07-10.
[9] Muhammad Burhan Sharif, Abdullah Anjum, Muhammad Akram Tahir, Muhammad Yousaf, 2013, "Performance of pozzolanic concrete using different mineral admixtures". Pak.J.Appl.Sci, Vol.12. 73-81.
[10] Aiswaraya.S, Prince Arulraj G, Anand Narendran, 2013," Experimental investigation on concrete containing nano-metakaolin". IRACSTEngineering science and technology, Vol:3(1), 180-187.
[11] Ajayi.A.O., Atta, A.Y.Aderemi, B.O, Adefila.S.S, 2010, " Novel method of metakaolin dealumination – preliminary investigation". Journal of applied sciences research, Vol:6
[12] Shelokar Ajay P, Dr.Jadhao Pradip D,2013, " Strength appraisal of high grade concrete by using high reactive metakaolin". IJIRSET. Vol:2(3), 657-663.
[13] G.Murali, P.Sruthee, 2012, " Experimental study of concrete with metakaolin as partial replacement of cement". IJETED,Vol:4(2), 344-348.
[14] Dr.Amer M.Ibrahem, Khalid A.Abdul Wahab, 2008, " Effect of temperature on the pozzolanic properties of metakaolin produced from Iraqi kaolin clay". Al-Faith Journal No.28.
[15] IS :4031(part 4)-1998 "Methods of physical Test for Hydraulic cement "
[16] I.S. 12269-1987, Specification for 53 grade ordinary Portland cement.
[17] I.S. 456-2000, Indian Standard Plain and Reinforced Concrete – Code of Practice.
[18] I.S. 4031-1988, (Part – 5) Methods for physical tests for hydraulic cements: determination of initial and final setting times.
[19] I.S. 4031-1988, Methods for physical tests for hydraulic cements.



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