

EXPERIMENTAL INVESTIGATION OF METAKAOLIN CONCRETE

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ABSTRACT

It reviews the published research on the effect of the use on structural concrete engineering properties with letter structure (Mk). The review has shown that cement replacements with relatively low MK had reduced the measured work efficiency of concrete and increased the strength of the early age compared to the compact strength of the post-concrete age. The effectiveness of MK was considered important with hormonal power and the modulus of elasticity was least affected. Depending on the dependent time of MK with Calcium Hydroxide (CF), the reduction in punching and pore structure purification in hard paste and concrete . As a result, due to chloride reach and controlled expansion, the stability of the concrete for the alkali-aggregation-reaction has increased due to increased resistance. The use of cement supplemental materials in structural concrete has now been widely accepted by the construction industry for technical, economic and environmental reasons. The carpeting at high temperatures is a solid material manufactured by colly, which is suitable for use in concrete mix.

KEY WORDS: *Cement, Metcalin, Calcium Hydroxide, compact block, stability*

1. INTRODUCTION

Cement concrete is the most important building material used in the world. The reason for its widespread use is that it provides good functionality and in any form can be cement and steel production environment due to the emissions of CO and dust particles in the environment.

. Under impact and dynamic loading plain concrete passes through wide cracking and brittle failure. Every structure has its own intent aim and therefore, in order to fulfill this objective, modification in traditional cement concrete has become mandatory. . Concrete consumption is approximately 10 billion tonnes per year, which is equivalent to 1 ton per person. In the last few years, many research and modifications have been made to make concrete, whose desired characteristics are in addition to Portland cement, of concrete components The materials used in the form are used in concrete search with high strength and stability, always in this case, mixed with

concrete mixed The cement concrete is one of the most common materials used in fiber manufacturing industry, which has been presented in line with the current requirements. Plain concrete has good compressed power but has less tensile strength, less flexibility and less fire resistance. Therefore, judicious use of cement and steel has various economic and environmental impacts. Concrete concrete is a brittle material that is weak in concrete stress and hence to overcome this problem, the cement concrete is reinforced with steel rods and thus it is called reinforced cement concrete (RCC). In this modern era, civil engineering construction has its structural and sustainability requirements

1. MATERIALS AND METHODS

As we know in the current approach to the concrete power of solid cubes, the different tensile strength of the solid cylinder, the power of the flow of the concrete beam. In these cases, we have to wait 28 days to determine the strength of cubes, cylinders and beams. The current research work is experimental and requires a preliminary investigation in a methodical way.

2.1 Materials and Grade of Control Blend

1. Control mix type and selection of grades, mixing the design by a suitable method, the test mixes the final mixing ratio.
2. Metacolin's procurement properties.
3. The total quantity of concrete required for the whole experimental work is being estimated.
4. Estimated quantity of cement, precisely consolidated, coarse aggregates, metacolin. Testing the properties of cement, precisely consolidated, coarse total .

2.2 Production of Concrete Mix

1. The control mixture (normal concrete of grade M-30) in the laboratory is done by the ACI method design ratio.
2. Metacolin is added to the sand concrete as cement replacement on the constant weight of cement weight of 10%, 20% and 30%.

2.3 Content

2.3.1 Cement

Cement is used in this experimental work "All the properties of cement are tested while mentioning the IS 12269 - 1987 specificity for the 53 grade general portland cement" Ultra Tech 53 Grade Ordinary Portland Cement ". The results of the test are presented in Table (3.1).

2.3.2 OK All

Natural sand is used from Bhima river (Nimgaon Khalu), which confirms IS 383-19 70. [46] Different qualities such as specific gravity, water absorption, sieve

analysis etc have been organized to know their quality and grading on FA. The results of the above testing are shown in the table

2.3.3 Resources overall

Total resources are used from Shrigonda (Wadali), who ratifies the IS 383-19 70. Various qualities such as specific gravity, water absorption, impact power, crushing strength, sieve analysis etc. have been organized to know their quality and grading on CA. Overall, the total size black mesh below 20 mm below and 10 mm was used to confirm the basalt rock i 383-19 70. The results of the above testing are shown in the table

2.3.4 Water

Potable water available in the laboratory is used for concrete mixing and treatment.

Table No. 3.1: Properties of Metakaolin

Chemical	Composition
SiO	50% - 55%
Al ₂ O ₃	38% - 42%
CaO	1%-3%
TiO ₂	0.8-1.2
Na ₂ O	<1%
Fe ₂ O ₃	0.2-0.5
K ₂ O	<1%
MnO	<0.5%
MgO	<0.1%
Loss on Ignition	Max 1.5%
Physical	Properties
Bulk Density	0.5461 (When

(g/cc)	packed)
Color	White
Specific Gravity	2.30

3. NECESSITY

MK is the material used in the form of a mixture to produce high power concrete. In Korea, the use of this material was mainly restricted to fire retarded walls, but recently began to get applications for the replacement of silica fume in high-performance concrete construction. To evaluate and compare the mechanical properties and the stability of the concrete using the MK, the following tests were performed on solid samples using various substitutions of silica fume and MKK; Mechanical testing such as compactive, tensile and flexible structural tests, durability testing such as chloride permeability test, immersion testing in acid solution, repeated cold and thawing test and accelerated carbonation test. Power tests showed that between 10% and 15% between the replacement rate of MK, the most suitable power was obtained for the binding machine. It has been observed that resistance to chloride ion reach has decreased considerably because the ratio of silica fumes and MK tyrants has increased. Compared to the normal concrete, the effect of the filler as a result of the fine powder of the two binders was seen to significantly improve the resistance of chemical attacks. Durability tests have also verified that concrete using MK demonstrated solid and mechanical and durability characteristics using silica gauze. The tests implemented in this study have confirmed that the Mk cost constitutes a promising material in the form of an option of prohibitive silica fume.

Due to the limitations of resources, the quality of life, the environmental conditions and the economy have made it mandatory to find other options for the core ingredients of concrete. Along with the stability and serviceability of the

structures, the person wants to build the structure beautifully and rapidly. To meet these requirements- new technologies, new manufacturing practices and new concrete making materials are being used. In today's world, various types of civil engineering structures are coming in the picture, to keep more demand on material performance, the need for more fundamental information about the different types of concrete behavior and the weight of MK concrete is of prime importance. In order to discover the above factors and new products, human curiosity has done important research on this subject.

As we know, brittle failure is the underlying property of plain concrete, that is, the fracture has very little tensile strength and less stress. These shortcomings of plain concrete are removed by adding strong bars or steel, the main defect of the redevelopment steel is corrosion due to the entry of chloride ions in concrete. This problem becomes serious in the coastal areas, with corrosion time of steel bars rust rust. This corrosion is larger in volume than iron, which results in extension. This expansion focuses on large tensile concrete on which the cracks are formed and thus leads to concrete by spreading the cracks. In order to overcome this shortage, the fibers have been included in the cement concrete.

There are various types of fiber available but here steel fiber is used to strengthen their high tensile strength, flexibility, ability to spread cracks, better bonding. Now one day the world is one of the most widely used materials in the concrete building industry. As concrete is a popular and important building material, a lot of research is done and some concrete methods are still underway to improve the mechanical properties. MK's concrete use provides durable and mechanical excellent solids

Many research work has been done and MK is also running as a cement replacement for the use of steel fiber and to increase the various properties of concrete. The research work done by various researchers is briefly discussed here.

4. LITERATURE SURVEY

A) Introduction

Now one day the world is one of the most widely used materials in the concrete building industry. As concrete is a popular and important building material, a lot of research is done and some concrete methods are still underway to improve the mechanical properties. MK's concrete use provides durable and mechanical excellent solids

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B) Research conducted by various investigators

[1]

They have been concluded that the physical and chemical properties of both MK and Cement are in compliance with the standard. Cement replacement with MK increases the compact strength for the M-35 grade of concrete. Compactable strength has decreased from 16% to 3, 7 and 28 days of treatment period. To obtain highly compressed power, the maximum amount of MK is 12%. M increases the compressed power of concrete by more than 10%. In the mixed mixture with high percentage of MK, the demand for water will be more due to MK's beauty. In order to maintain the efficiency of concrete at the construction site, the use of Super Mk becomes necessary, with the effective use of MK in the optimum percentage of concrete, it can be solid economic and environmentally friendly.

[2] fL (Oct-2014)

They have concluded the compressed power of solid growth at optimum dose of 25% MK with 1% Super M. The average value of 28 days for compression power was tested. The average value of 28 days for the fluctilation

structure was tested for the divided density of 28 days average value was found 25% (with the load of cement)% loss of compressed power of concrete decreases when the control mix Compared to 53.75%, when immersed in the solution for 60 days. 25% of the headrogen (with the weight of the cement) decreases the loss of compressed power of the concrete, when compared to the control mixture, 53.75%

When immersed in the solution for 60 days it can be concluded that percentage is minimal due to weight loss and 25% MK solution.

[3] p. IN (September 2013)

They concluded that the use of MK has reduced the plastic density of the mixture as partial replacement of cement. Results show that the use of local MK and cement has been designed for the ratio of less than 0.3 water / binder, high power and high performance concrete can be developed and more than 100 compressed strengths should be realized. Could. The optimum replacement level of MK was 10%, which gave the most compact power over the level of other replacements; This was due to the effect of partial cement replacement dilution. These concrete demonstrated the 28-day division tensile strength of the order of 5.15% of its compressed power and showed a relatively high value for the modulus of elasticity. The result of division tensile strength and elastic modulus has also followed that trend of the results of compressive strength showing the highest value on 10% replacement. As far as the durability properties are concerned, due to increased replacement percentage in local MK, water permeability, absorption, and chloride permeability were found to be reduced. This can be due to the effect of MK particles, which have significantly reduced the permeability or punching of concrete.

[4] B. B IN (June 2012)

With the increase in the content, the compressed power of concrete growth of 7.5% has been concluded.. After this,

there has been a slight decline in strength for an additional amount of 10%, 12% and 15% of which W / B ratio and delayed activity decreases. In the case of an increase of 7.5%, high power is due to the adequate amount available to react with calcium hydroxide, which accelerates the hydration of the cement and makes the C-S-H gel. An additional increase of 7.5% in MK in cement is the optimal percentage of the compressed power at a rate of 7.73% compared to the control mix sample compared to 28 days. High reaction in cement increased 7.5% increase in MK resistance to chloride attack has been increased. Control of compressed power of concrete has decreased by 3.7% with 7.5%, while the reduction in the strength of the control mix sample is 4.88%. Resistance of sulphate attack has also been increased with increase of 7.5% in high reaction MK in cement. Compared to the reduction in strength of control mix samples by 9.29%, the compressed power of concrete has been reduced to 7.5% Mk by only 6.01%.

[5] Lu and (2012)

Lu and H conducted a comprehensive experimental program, showing the operation of MK solid high power concrete under the operation and compression of high power concrete. Stress-stress relationships and failure criteria were used to assess the effect of steel fiber reinforcement on the mechanical properties of high power concrete in compression, which was found to be trivial.

[6] Ram and Thomas (July 2009)

Ram and Thomas proposed the model to predict various mechanical properties of steel MK concrete. The models were derived from regression analysis of test data. The strength of the predicted steel fiber reinforced concrete using the proposed model was compared with the current study with comparative data and along with other test data reported in the literature. The proposed model described test data as very accurate, the study indicated

that due to the introduction of fiber in fiber matrix interactions, significant contribution has been made to increase the mechanical properties, which differ with both existing models and formulations depending on the law of the blends. is.

[7] In 2007

According to both BA and SP researchers, large-diameter crude steel fibers are often used in solid form in the form of reinforcement. Such large diameter fibers are cheap, do not reduce the work of spreading easily and converting unnecessarily. However, due to their large diameter, such fibers are also inefficient and the resulting mk concrete reduces the brutality. Therefore, while maintaining functional, fiber and low cost, stiffness with large diameter fibers can be enhanced by hybridization with small diameter, then an experimental program was done to investigate. The results show that such hybridization can improve a lot of fungal fibers with small diameter fibers, rather than a part of the fibrils. The results also suggested that such hybrids alone fail to reach the level of mercilessness displayed by small diameter fibers.

[8] Tong Ding and Lee (August 2002)

Ding and Lee studied the effects of MK and silica fume on various properties of concrete and compared it. On a water / binder ratio of 0.35, 7, 5, 10, and 15% cement was replaced by Mk or Silica Fum. Concrete testing was done for recession, compressed strength, free shrinkage, resistant shrinkage and chloride dissociation. Mk-modified concrete showed better performance than silica fume-modified concrete. As the level of replacement increased, the strength of the MK-modified concrete increased the silica fume-modified concrete of the same age as all ages. Both mineral reagents used to reduce the contraction of free-drying and used to control shrinkage cracking width. However, there was already a break time for these two

concerts. Two admixtures of concrete chloride diffusivity significantly reduced.

[9] e. , ST, V, E. (September 2002)

A similar behavior related to the production of MK produced as well as commercial one strength and stability of concrete indicates and produces concrete production with excellent performance. Mk has very positive effect on 2 days and especially concrete strength In 28 days and 90 days. Mk reflects significantly less chloride permeability, gas permeability, and pore size than concrete concrete.

[10] M.D. D. Thomas (2001)

The investigation carried out by the above authors has shown that the increase in temperatures in MK-PC mortars (above 5% MK and at least 15% MK) is equal to PC mortar (in addition to very few MK levels). Due to the increase in heat growth during the initial hours of hydration, the accelerated Portland cement was combined with the combined effect of hydration and reaction. Compared to PC mortars, PC temperature is less compared to mortar; During this reaction, the weakness of the latter is attributed to the weakness of the PC by coupling with the negligible activity of the latter, the rate of heat growth and total heat both evolve.

[11, Eddie, Shah, (January 2001)

Shah, and breakers, detected the relationship between permeability and crack width in steel fiber reinforced concrete. It also inspected the effect of steel fiber reinforcement on solid permeability. Results show that steel reduces the permeability of fiber samples, which have cracks greater than 100 microns. [12] Moises Fries, Joseph Cabrera (2000)

The authors have shown the results of an investigation focused on the effect of MK-blended paste on the microscopic structure (Mk). Gastro containing 0%, 10%, 15%, 20% and 25% of MK was prepared in the proportion of the continuous water / binder of 0.55 and the hydration period for 1 to 360 days was cured at 200C. He examined

the development of total capillary and gel cavity with the treatment period and estimated the degree of hydration in the ordinary Portland cement and MK mixed sticks. The values of hydration degree are calculated by the amount of CA (OH) 2 contained in the paste (Paste) and the data of differential thermal analysis. A good relationship has been established between the degree of punching and hydration. Total porosity decreases for 28-56 days of treatment time. They found that, for treating dizziness, for 28 to 56 days, all the mixes are the same. After 56 days, all MK punching increases compared to Mixed. Similar phenomenon is observed for the capillary hole, the best evidence of MK's effect on the refining of the patchwork structure was found in the pore with a small radius of 100A. Between 7-90 days, MK gel increases barbasi, while in fact it stays stable. The results reflect the need to achieve significant improvement in porosity to reduce average pore diameter and gel cavity. The measured lime material shows the total consumption of MK (10% to 15%) in the 9 days of hydrating time. A good statistical relationship has been found between the degree of hydrotherapy and porosity

[13 J.M. Et al (2000)

Contributions by the authors of this paper are a part of a continuous investigation into the investigation of mixed fuel ash (Mk) for alleged cements investigating the ability to use MK. Investigation involves investigating the effects of blends on strength development and factors that affect stability, including chloride penetration, carbonation and water transport properties. The following conclusions were made by the authors: Although the initial compressed power of the concrete is included as a partial replacement of cement, the action develops in the medium term and up to 30% the power can be used without less than 90 degrees. The day is particularly effective in the medium-to-water-to-binder ratio of 0.4 and 0.5 in this regard. From MK results, strength has increased

significantly in both the short and medium term, up to 15% partial cement replacement. To increase strength, all water has been received for bipolar ratios (0.4-0.6). In the development of strength, especially in the early stages, the opposite roles of MC can be compared with effective blends for cement. At low treatment times, the mix of low PC replacement levels and high M-proportion gain strength only over control. However, after 90 days of treatment, mixing with high PC replacement level and low MK also gain strength over control. Adding small amounts of partial cement placement The speed of PC hydration increases, which in turn increases the increased strength.

[14] Brooks (2000)

After studying the effect of silica fume, after blowing the ash and ground granulated blast furnace lava on the establishment of the time of high power concrete, he concluded that by MK as per 10% replacement and percentage replacement of cement Increased retention effect has increased, retarding effect is less

[15], Wei Sun, Chen (1999)

In their investigation, the effects of effectiveness and fatigue performance were studied under the action of the repeated dynamic load of high power concrete, silica fume high power concrete, steel high power concrete, and steel silica fume high power concrete. The mechanism by which silica fume and steel were tested to reduce damage. The results show that, implications and implications of cracks were effectively prevented during steel failure. The presence of steel in high power concrete was effective in restoring the structure under fatigue and effect by delay in the process of damage. Silica fume effectively improves the structure of inter-face, eliminated the weakness of the interfacship zone, reduced the number and size of the cracks, and enhanced the ability of steel fiber to break down and prevent damage. As a result, the inclusion of steel and silica fume can increase a lot of performance under impact and exhaustion. The filler of silica fume can reduce the number and size of the original cracks in the

area and can be increased in the bulk of the concrete and the L effect. Steel is mainly strong, strong and opposed to break in

[16] F. Chio and BA D (1998)

In his investigation, the co-axial cylinder of MK-containing cement paste has been studied with the rotational viscomator. They show a behavior that is strongly dependent on the water-proofing machine ratio at the level of the replacement of MK and cement. Mk is caused by the angle and plate like the size of the particles, they concluded that the amount of water in the water binding ratio, MK and its beauty is controlled. In the end, the properties can be explained by considering the angular size of the plates and MK particles compared to the SF.

5. GOALS AND OBJECTIVES

The purpose of this study is to check the behavior of MK concrete (MC) composite with different types of pieces and check the following properties:Determine the quality of concrete using non destructive testing

5. STRUCTURE OF KAOLIN

Structurally, in the kaolium there are alumina acetadral sheets and silica tetrahedral sheets which are alternately surrounded with the theoretical structure of 46.54% 39.50% and 13.96% of water. The arrangement of atoms in the Covalent Group is shown in Figure 3.2.



Figure:3.2 frame of kaolin

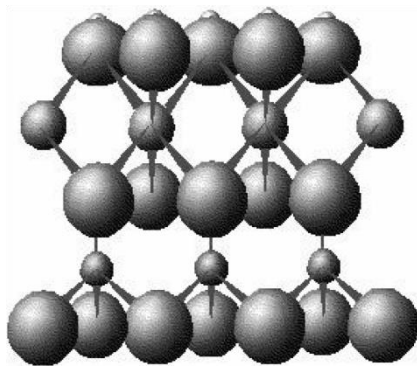


Figure 3.3: structure of kaolinite

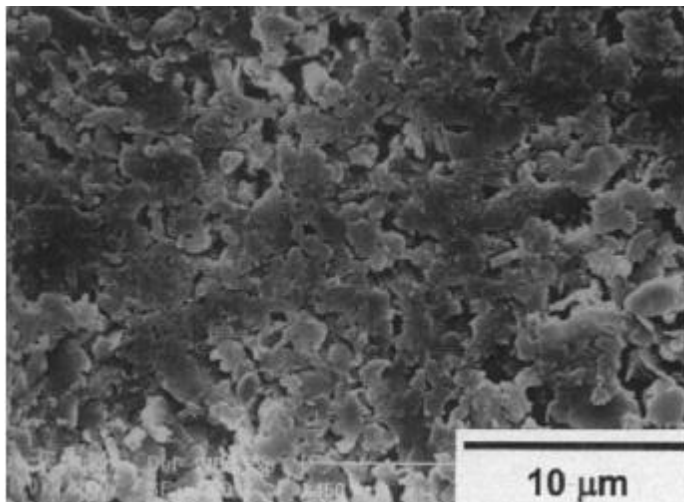


Figure 3.4: Metakaolin Particles

Kaolin is one of the most versatile industrial minerals. It is chemically inactive on a relatively broad pH range, is in white color and has good covering power when used as a color or expander. Kaolin is soft and non-abrasive, and has low conductivity of heat and electricity.

calculation formula

Specific gravity = $\frac{\text{weight of sample}}{\text{weight of empty flask}}$

6. Area of the future

1. Environment friendly

Based on the findings in this study, it is recommended that no other work will be done by the Co-Strat Project on development as this time. When a better and pragmatic product has been developed by the oil-sand industry and research community, it is recommended to start a case study project using this material.

1. Research community

Opposing to break and control the damage As a result, the inclusion of steel and silica fume can increase a lot of performance under impact and exhaustion. The filler of silica fume can reduce the number and size of the original cracks in the area and can be increased in the bulk of the concrete and the L effect. Steel is mainly strong, strong and opposed to break in

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5. GOALS AND OBJECTIVES

The aim of this study is to check the behavior of MK concrete (MC) composite with different quantities of fragments and check the following properties:

1. Mixed strength properties with different properties of Steel Mk Concrete (MC) such as compact strength, splitting tensile strength, flexural strength and strength pull out.
2. Check the properties of fresh concrete, such as functionality and density.
3. To compare the properties of this special concrete with normal concrete.
4. Studying deflection characteristics of concrete mixed with different quantity differences.
5. Determine the quality of concrete using non-destructive testing

5. Structure of Kaolin

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Figure: frame of kaolin

$\frac{\text{weight of sample}}{\text{weight of empty flask+cement}}$

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calculation formula

Specific gravity = $\frac{\text{weight of sample}}{\text{weight of empty flask}}$

where,

Empty flask weight
Empty flask weight + cement
Empty flask weight + cement + water
Empty Flask Weight + Water

6. The future Scope, University of Alberta, Calgary University, and other interested parties are continuing their research work on the extraction of this source of kaolin. this is

It is also recommended that research be continued on the use of concrete so that information about other levels such as AA, SF and MK can be obtained. The oil sands industry should provide samples as needed.

2. Oil Sands Industry

Oil sand industry continues to check the methods of economic quality to clean manure ponds, and is researching the quality of the kaolin extract that can be used to compare the quality of pure MK . In addition to continuing investigations in other third party groups interested in production, other uses and investigations will be done for this. Oil sand industry will also try to find a way to reuse the process water from basal ponds rather than continuously drawing on fresh water and increasing the size of ponds of residues. This study will be completed by 2005

3. Concrete Industry

After successful results from the sands industry of oils, ready mixed concrete growers should experiment in concrete and have confidence in its use. Ready-made concrete producers in the oil-sand industry should provide adequate samples for testing. It is further recommended that once the solid industry has adopted this material in alternate form, the oil-sand industry and research community have upgraded the knowledge and quality of this material.

6. FUTURE SCOPE

1. Environment friendly

Based on the findings in this study, it is recommended that no other work will be done by the EcoSmart™ Concrete Project for the development of CMFT as SCM. When a better and pragmatic product has been developed by the oil-sand industry and research community, it is recommended that eCosmast used this material to start a case study project.

7. CONCLUSION

Calcined mature fine relics is a material that is similar to pure but low quality (Mk). R is dark, which makes low-value products (e.g., white concrete products, paper) in most of the potential markets identified in today's date. It is less reactive than pure MK (85 -90% effectiveness), is almost reactive in portland cement, and only slightly more reactive than fly ash (FAA) (18% more reactive).

It is more energy and is condensed to produce from FA, where both materials are sub-products of industrial processes. Its energy intensity is also less beneficial than FA. At present, according to market conditions, at least four times more expensive than FA.

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