Strength and Durability Studies on Micro Concrete

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Abstract - The use of pozzolanic materials in concrete to partially replace cement is increasing. Economic benefits are obtained by replacing a significant portion of cement with low-cost natural pozzolan or industrial by-products. The durability of the final product is also increased. Pozzolanic can be used to increase durability, reduce costs, and reduce pollution without reducing the final compressive strength or other performance characteristics. To investigate the durability and strength properties of micro-concrete, an extensive literature study was performed. From the review of the literature, it was found that industrial wastes such as fly ash, Ground Granulated blast slag, waste glass powder, silica fumes and metakaoline products are used to produce concrete. In this study, it is proposed to produce micro-concrete by replacing cement with Ground Granulated blast slag and waste glass powder.the strength and durability studies will be performed.

***Key Words*:** Micro Concrete, Rehabilitation, GGBS, Waste Glass Powder, Strength, Durability

1. INTRODUCTION

Micro concrete is a cement-based coating that can be applied thinly (about 2-3 mm) to various surfaces, including tiles and wood. It offers the look and feel of concrete at a fraction of the cost and weight of real concrete. Micro concrete is a great option for bathrooms and kitchens because it offers a hygienic and spotless surface. In addition, the material is resistant to slip and mold, making it an excellent choice for indoor and outdoor floors. Micro concrete is often used because it can dry quickly, giving designers and those looking to decorate their home a surface option that will minimally interfere with their other projects. In fact, it dries so quickly that the coated surface could be ready for use in a day. Because Micro Concrete dries so quickly, it can be applied one day and used the next, making it a great choice for those who want to get projects done quickly.

High initial strength microconcrete is frequently used in repair and restoration projects. It is mostly utilized to increase the RCC column's load bearing capability and to repair beams and other reinforced concrete components. Despite all of these benefits, the main reason that Micro Concrete was created was to use less water than ordinary concrete. Micro concrete was used successfully to repair damaged or old concrete structures because of its simplicity of use and ability to stick to other materials. Additionally, since there is no pumping required, less heavy equipment is needed. In addition to lowering application costs, this makes micro concrete a viable choice for inaccessible regions.

2. REVIEW OF LITERATURE

2.1 Micro concrete

Tsembelis and Proud (2005) studied about the micro concrete (70% fine-grain dolerite powder and 30% cement paste by weight) were performed to assess the dynamic behavior. Results showed that the Hugoniot curve and dynamic shear stress properties could be obtained. With regard to the shear strength of micro concrete, varying percentages of cement paste only had a marginal effect. The shear strength of this system seems to be mainly dependent on the matrix material - dolerite in this case. Although micro concrete accounts for 70% of dolerite, its impact on shear strength is significant.

Shen Dejian and LU Xilim (2008) investigated the relationship between constitutive ratio, compressive strength, modulus, peak strain and failure type and the strain rate of micro-concrete under compression was investigated. micro concrete gets stronger as the strain rate increases. The constitutive relationship and failure type of micro concrete with different strain rates are similar. The stress at the peak stress value does not change for different strain rates. Micro concrete depends on the rate of deformation. Compressive strength and modulus increase with increasing tension.

Rafat Siddique et al (2011) studied the strength and durability of microstructural properties of concrete partially replaced by foundry sand. The proportion of fine aggregate in the replacement mixture varied from 0% to 60%. According to the test results performed, the optimal usage rate of foundry sand to partially replace fine aggregate is 30% and does not exceed 50%.

Laneza et al (2011) investigated about the new generation of micro concrete, which has an initial as well as a final high mechanical performance. To attained this, 15% by weight of the Portland cement have been replaced by materials rich in Silica (Slag and Dune Sand). The results attained from the Reactive powder concrete that tensile and compressive strengths raised when incorporating the addition, therefore perfecting the compactness of mixtures through filler and pozzolanic effects. With a reduction in the aggregate phase in RPC the artificial by- product of the blast furnace slag is used for the abundance of the dune sand (southern of Algeria).So the use of RPC will allow Algeria to fulfil provident as well as ecological requirements.

Mahmoud Khashaa Mohammed et al (2013) studied the microstructure and hydration properties of durable SCC using limestone powder and fly ash. The replacement rate for fly ash and limestone is 33% of the cement content. The freshness and properties of the concrete samples were tested. X-ray diffraction (XRD), scanning electron microscopy (SEM) and energy dispersive spectroscopy (EDS) analyzes were performed to examine the microstructural changes in ash-containing concrete. Microstructural studies show that SCC containing fly ash has a denser microstructure than SCC containing limestone powder. As a result, fly ash is suitable for sustainable SCC production.

Burak Felekoglu (2014) studied about the stress-strain curve and failure from of micro concrete are the same as those of ordinary concrete, but the strain corresponding to the same peak stress is larger, and the width of the failure zone is smaller than that of ordinary concrete.

Akanho Chakirou Toukourou et al (2014) studied about the optical microscope is used to study the micro concrete with the appropriate enlargement, the aggregates and cementing network are shown, along with a plethora of different sized pores. With a rise in the rate of fine gravels, the population of pores with a diameter between 5 and 50 microns becomes less and less dense. The decline tends to stop at a level of 50% fine gravels.

Divya Chopra et al (2015) studied about the effect of replacement of cement with rush husk ash as additional cementations materials and experimented its effect on strength, durability, and microstructure through their unique properties. The flow properties mechanical properties and durability were tested. Test result is fresh properties of self-compacting concrete with RHA revealed that increase in RHA decreases the workability. The compressive strength of self-compacting concrete with RHA increases up to 15% replacement of cement with RHA.

Vijayalakshmi et al (2017) studied about the performance of concrete used in repair and rehabitation self-compacting concrete can match the performance of micro-concrete in the repair and rehabilitation of RC structure. Two brands of micro-concrete available in the market were selected and tested for their mechanical properties and durability. From this, it can be concluded that the use of fly ash as a mineral admixture in concrete mixes improves durability properties compared to micro concrete. Self-compacting concrete has comparable mechanical strength and higher durability compared to micro concrete with aggregated.

Pravin et al (2017) investigated the modern techniques of the concrete formation there is a lot of interest in increasing amount of microfine particles (<75μm) in aggregates and it is important to understand their effect, including clay and nonclay mineralogy. Generally the sand used in construction industry in major metro cities is of manufactured type, which is obtained by mechanically crushing aggregates in washed or unwashed condition. After washing too some silt impurities remain in the sand and this study is carried out to understand their influence in high performance concrete (HPC).The study is carried out by preparing trial mixes, by adding 1% to 10% silt in washed manufactured sand by weight of sand for M-60 grade of concrete mix. The microfine on concrete is added with different proportion of silt content by washed and unwashed silt in concrete reduce the compressive strength, workability and but increase water permeability. By adding 5% of silt in concrete it does not affect the compressive strength, but beyond the 5% it will reduce the strength to 1MPa.

Ahmed Hussain (2017) studied about the impact of CFRP confinement on the three types of column specimens, research was done on how axial compression affected R.C. square, square micro-concreted to circular (SMC), and R.C. integral circular specimens. The degree of improvement in ultimate axial load carrying capacity due to CFRP confinement of R.C. square micro-concrete to circular specimens & integral circular specimens is greater than that of similar confinement of reinforced concrete square column specimens, it was confirmed that confinement by CFRP is an effective method of retrofitting for enhancement of ultimate load carrying capacity & ductility of column.

Vishal Gajjar et al (2018) studied about the ceramic tiles in micro concrete. Ceramic tile waste is classified into two categories, namely ceramic coarse aggregates (CCA) and ceramic fine aggregates (CFA). CCA is ceramic tile waste with a size between 4.75 and 10 mm, and CFA is ceramic tile waste in powder form with a size smaller than 4.75 mm. These waste ceramic tiles are added in different proportions to three different types of micro concrete and a total of 11 mixes are ready for testing. The compressive strength, tensile strength and absorption capacity of all mixtures were tested to investigate the mechanical and durability properties of micro-concretes with ceramic tile waste. The compressive strength of micro concrete at the age of 28 days increased when compared to conventional micro concrete.

Jonbi Jonbi1 et al (2018) investigated the modified micro concrete materials by adding Polycarboxylate Ether (PCE) and Polypropylene Fiber (PPF) at the time of rapid setting materials. It then tested flow tests and setting time at 16, 20, 30, 40, and 60 minutes, as well as compressive strength; and flexural strength tests at the ageing times of 3 hours, 1 day, and 7days. The micro concrete material was used directly in the field. The addition of PCE and PPF can increase the modulus of elasticity and flexural strength, meaning that the material is not easily cracked under the repeated strains of heavy traffic loads.

Naga et al (2019) investigated the sustainable materials of micro-concrete is very less when compared with new age conventional concrete, some of the effects of utilization of these sustainable material in micro-concrete. The compressive strength in the case of over-crushed limestone and quartz does not match the flexural strength due to the surface roughness of crushed limestone in fresh micro-concrete. Microconcrete with higher compressive strength shows higher bond strength than alternative concrete.

Gauri Charudatta Kadam et al (2020) studied about the permance study and utilization of micro concrete in different field. The mechanical properties and durability properties of micro concrete with addition of different industrial waste products. The change in the microstructure of concrete reflects the changes in properties of concrete. Thus, the microstructural change in concrete is mainly due to surrounding conditions such as time, temperature, chemical degradation due to acid attack etc., Many research on Microconcrete with combination of industrial waste in appropriate proportion best performance in mechanical and durable properties in comparison with conventional Micro-concrete. Micro environmental concrete prepared with admixtures like silica fume, fly ash etc, also gives better strength and durability. Due to the introduction of bacteria into concrete there has been increase in compressive and flexural strength while comparing with conventional micro concrete it decrease.

Gauri Charudatta Kadam et al (2020) studied about the performance of micro-concrete with addition of silica fume and Ground Granulated blast furnace slag which is very reactive pozzolanic material. Properties of material used for the experiment are find out then Specimens were casted, cured and tested to check the compressive, tensile and flexural performance of conventional micro concrete and microconcrete with pozzolanic addition. The replacing 15 % of cement by addition of same amount of silica fume and Ground Granulated blast furnace slag that compressive, tensile and flexural strength increases, thus improving the compactness of mixtures through pozzolanic effects.

Dipti Ranjan Nayak et al (2022) Investigated the examines how crack development occurs in micro-concrete mixtures when two different properties are present. Higher free shrinkage values and lower bond strength are not the only properties to consider, unless those properties are very high or very low. The free shrinkage of the material is high, but materials with a high bond strength exhibit less crack width due to differential shrinkage. Differential shrinkage cracks develop with finer aggregate in micro-concrete. The magnitude and thickness of cracking damage of microconcrete can be recorded in the same configuration used for free shrinkage damage and differential shrinkage damage of the cementitious material. Free shrinkage force and bond strength are responsible for the different shrinkage of micro-concrete; a shrinkage value difference greater than 0.02% after 3 days indicates the destruction of the micro-concrete mixture sample and the replacement concrete at a later age.

Chunyu Zhang et al (2022) studied about the Dynamic model testing was used to study the material properties of microconcrete. Micro concrete has the same stress-strain curve and failure zone as regular concrete, but its strain is greater and its failure zone is narrower than that of regular concrete.

2.2 Concrete using GGBS

Lorca, et al (2014) studied about the replacing Portland cement in appropriate amounts with pozzolans such as fly ash has limitations due to the amount of calcium hydroxide produced in the mixture. Contribution of slaked lime addition to Portland cement + fly ash system. Cement replacement levels vary, ranging from 15% to 75%. Good mechanical results were achieved by replacing 50% of Portland cement with the same amount of fly ash + addition of slaked lime (20% of the amount of fly ash).

Malkit Singh And Rafat Siddique (2014) studied about the possibility of using coal bottom ash to replace fine aggregate in concrete. Test results show that the compressive strength of concrete containing clinker at a curing age of 28 days is not affected too much. However, after 90 days of curing age, compressive strength of bottom ash concrete surpassed that of conventional concrete. He also compared these properties with those of natural aggregates and concluded that recycled aggregate concrete is more resistant to carbonation than natural aggregate concrete.

Rajith and Amritha (2015) investigated the behavior of M30 concrete with replacing cement and fine aggregates with ground granulated blast furnace slag and granulated blast furnace slag. Compressive strength increases as it increases granulated blast furnace slag percentage up to 50% and ground granulated blast furnace slag up to 25% in concrete. split tensile and flexural strength of concrete is also increased up to 50% replace fine aggregate with GBS and replace up to 25% of cement with ground granulated blast furnace slag.

Muhammad Rizwan Akram (2015) studied about the performance of conventional Portland concrete containing cement substitutes in binary and ternary systems. The concrete was prepared to have a constant water-binder ratio of 0.30. However, the strength is greater than or equal to the strength of 100% OPC samples, indicating that these mixtures can produce concrete samples equivalent to high-strength concrete samples or equivalent. Compared to SF and GGBS concrete at all stages, from a cost point of view, it can be suggested that a combination of 60% OPC, 5% SF and 35% GGBS can be advantageously used to Improves compression resistance of concrete.

Sridevi et al (2016), investigated the compressive strength and flexural strength of concrete made with ordinary Portland cement, partially replaced by crushed blast furnace slag with different ratios ranging from 30% to 60%. The compressive and flexural strengths of GGBS concrete increased when adding 30% GGBS. GGBS concrete shows slightly reduced compression and flexural properties compared to other alternative concretes.

Vijaya Bhaskar Reddy and Srinivasa Rao (2016), studied about the strength and durability characteristics of three-layer mixed concrete partially replaced with used GGBS and the silica effect. The workability of fresh concrete increases the GGBS content up to 30% and the density of the fresh mix increases with micro silica and GGBS. The combination of 10% micro-silica and 30% finely ground blast furnace slag provides the highest compressive strength for all-day curing compared to conventional concrete.

Chalamcharla Venu Gopal et al (2017), studied about the experimental research on partial replacement of cement with GGBS (0% - 50%). The compressive strength test result is 20% replacement with GGBS increased compared to conventional concrete. The workability of replacement concrete is reduced compared to conventional concrete.

Kasu Naveena, and Anantha Lakshmi (2017), Studied about the concrete strength using metakaolin and GGBS as adhesive materials. The experimental study was carried out by completely replacing slag with cement and partially replacing slag and mineral additives by weight in the form of 3 blocks using M30 mixture. Durability tests showed that the best durability properties could be achieved with 30% replacement of GGBS and metakaolin. From the overall experimental analysis, GGBS and metakaolin achieve high strength compared to conventional concrete

Sonali et al (2017) Studied about the GGBS, RHA and QS to partially replace cement and sand in concrete. The cube sample was prepared for the compressive strength test, the cylindrical sample for the tensile strength test, the beam for the flexural strength test and the permeability voids test. Increase the compressive strength when the ratio of mined sand increases to a certain limit. The concrete achieves its maximum compressive strength, with 60% of the mined sand being replaced by natural sand for M40 grade concrete. Maximum flexural strength after 28 days was achieved with mix A4 (60% QS and 40% NS) and mix B2 (20% cement replaced with GGBS). The workability of concrete decreases with increasing RHA but GGBS increases.

Pratibha Chavan et al (2017) investigatd about the use of scba and ggbs ash by partially replacing it with cement and adding steel fibers. The author explains that adding sugarcane pulp will increase concrete pouring time by several hours if more sugarcane pulp is used. The reason for this is the shelf life of the plant products contained in the concrete mixture. affects the reaction between water and cement, thereby slowing down the concrete mixing process. The compressive strength of concrete with 20% SCBA and 10% GGBS is nearly 4 MPa higher than that of conventional concrete at 28 days of age. The tensile strength of 20% SCBA and 10% GGBS concrete was nearly 1 MPa higher than that of conventional concrete after 28 days.

Balamuralikrishnan and Saravanan (2019) Studied about the effects of AL and GGBS in replacing cement materials and the durability of concrete. All different combinations of partial cement replacement with alccofin and GGBS. The maximum compressive strength of concrete achieved when using AL10% and GGBS 30% is 38.08 N/mm2 higher than conventional concrete. Minimal loss in weight and compressive strength was achieved by the C60A10G30 mixture for acid attack tests, sulfate attack tests and chloride attack tests. According to the acid attack test results, the compressive strength loss is 28.76%, lower than that of conventional concrete, and the mass loss is 4.987%, lower than that of conventional concrete. According to the results of the sulfate attack test, the loss of compressive strength is lower than that of conventional concrete.

Revathy et al (2019), investigated the characteristics of concrete partially replacing cement with finely ground blast furnace slag (GGBS). Maximum compressive strength was achieved when cement was replaced with 40% GGBS. Maximum flexural strength is achieved by replacing 40% of GGBS cement. Maximum tensile strength is achieved by replacing cement with 50% GGBS. By replacing GGBS with cement up to 40% and increasing the compressive strength of concrete. To increase compressive strength, this substitution is used in the construction of prefabricated structures.

Ashwini Kumar Singh et al (2020), investigated the compressive strength of M30 concrete (Design Mix) made with ordinary Portland cement 53 Garde, partially replaced with GGBS at the rate of 0%, 10%, 20%, 30%. Increasing the GGBS content in concrete reduces the compressive strength of concrete, but a partial replacement of 20% can be considered because the compressive strength value is close to that of conventional concrete. The use of GGBS in concrete is economical because it is considered a waste product of the steel industry. And thus reduce costs, resist chemical attacks.

Poojary Sanath et al (2020) studied about the partial replacement of cement with ggbfs and fine aggregate with ggbs in concrete. The compressive strength of GGBS and GGBFS concrete blocks decreased as the percentage increased. And it gives better compressive strength than regular concrete. Specifically, using GGBS and GGBFS to replace cement helps reduce costs. The workability of concrete increases as the amount of GGBS replaced increases. The flexural strength of concrete also increases when replacing cement with GGBS and GGBFS.

Adek Ainie Mat Dom et al (2021) investigated the GGBS replacing cement in concrete (30% to 60%). The compressive strength systematically decreased as the GGBS concentration increased. All mixes have strengths below that of conventional concrete. At replacement levels of 70% or more, strength is clearly lost. The fineness and particle size distribution of GBFS have an impact on its reactivity and cementitious strength development. GGBS improves the structure of concrete as its percentage increases.

2.3 Concrete using waste glass powder

Sunny et al (2013), studied about glass powder obtained from green crushed glass to a particle size of 300 µm used as a partial replacement for cement. Increasing the amount of glass in the mortar results in a general decrease in compressive strength, but this decrease decreases as curing time increases. Flow table testing demonstrated that when higher glass workability content is introduced, the alternative shape of the glass is reduced. Conventional mixtures have the highest level of workability compared to other mixtures. Water absorption increases as the glass powder content increases. Moderate replacement levels such as Mixing with 5% glass powder and Mixing with 20% glass powder reach similar values to conventional cement mortar cubes.

Gunalaan Vasudevan and Seri Ganis Kanapathy pillay (2013), investigated the use of ground glass powder in Portland cement and combine it with other wastes. Concrete using glass powder has very high workability from conventional concrete. In terms of strength, concrete using used glass powder has an average strength of over 14 days, however when concrete reaches 28 days, the normal mixture has a higher value than the mixture containing used glass.

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Yogesh Aggarwal and Rafat Siddiqu (2014), studied the effect of waste sand and bottom ash in equal quantities when partially replacing fine aggregate with different proportions (0% to 60%) on the properties of concrete. The inclusion of waste sand and bottom ash as fine aggregate does not affect durability. negative properties because the resistance remains within the limits except for the 60% replacement. Micrograph of SEM analysis shows proper and clear fiber pattern of C-S-H gel, which makes concrete more resistant to aggressive situations as observed in chloride penetration test values.

Jitendra et al (2014), Glass powder was investigated, tested, and compared to conventional concrete for its compressive, tensile, and flexural strength up to 60 days after being partially replaced, with percentages ranging from 0 to 40 and intervals of 5%. Compressive strength increases by roughly 30%, which is the largest amount. In terms of flexural strength, the largest percentage gain occurs when 20% is replaced with GPL, which is around 22%. The compressive strength of cement that had more than 20% of its weight replaced with GPL decreased. As the percentage of glass powder rises, so does the workability of concrete.

Mohd Vasique Hussain and Rajiv Chandak (2015), investigated the behavior of M-30 type concrete for compressive strength and tensile strength by partial replacement of cement with glass powder used. By replacing 10% of cement with powdered glass, maximum strength is achieved compared to conventional concrete and other cement replacement ratios.

Shruthi.S et al (2015), studied about the used glass powder used to partially replace cement. Mechanical properties such as compressive strength and tensile strength are measured. To test the strength effect of replacing cement with glass powder, cement was replaced at ratios of 5%, 10%, 15%, 20% and 25%. The slump of concrete appears to be increased due to the presence of glass powder in the concrete mixture. At 10% glass powder, the compressive strength of concrete is greater than the control. Beyond 20% glass powder, quality drops significantly. The strength of concrete using waste glass powder had a higher average strength after 14 days, but when the concrete reached 28 days, the control mixture showed higher contrast than the mixture containing Glass powder used simultaneously gives high M30 values.

Sadiqul Islam et al (2016), investigated the Waste glass powder as partial replacement of cement (0%-25%). The potential of waste glass powder to produce sustainable concrete and performance of glass in mortar. The optimum glass content is 20% considering mortar and concrete compressive strength was found slightly higher (2%) than the control concrete specimen.

Smail Ansari and Sheetal Sahare (2016), studied about the strength reduction of concrete when glass particles are used as fine aggregate in concrete. The strength of concrete increases when the size of glass powder particles is reduced. Glass powders with particle sizes less than 75 microns have pozzolanic properties. The compressive strength and tensile strength of conventional concrete increase when glass powder is used to partially replace cement. It has been observed that the strength of concrete is optimal at a partial cement replacement of 20 – 25%. In self-compacting concrete, strength properties as well as workability decrease as the glass powder content increases.

Siji Joseph et al (2016), studied about the conducted to replace cement in concrete with a variety of waste materials, which can save energy and provide significant environmental benefits. The authors suggest the use of waste to partially replace cement. He studied the use of waste materials such as glass powder, silica fume, fly ash, different types of shell powder, rice husk ash.

Hema (2016), investigated the replacing cement with finely ground 75 micron glass powder at ratios of 10%, 20% and 30%. This type of concrete is tested for compressive, tensile and flexural strength and compared to conventional concrete containing 100% cement. . According to testing, glass powder concrete offers higher strength than conventional concrete.

Aseel Basim Al-Zubaidi and Ahmed A. Al-Tabbakh (2016), studied about the mechanical properties and thermal conductivity of cement mortar made from waste glass with different glass and cement values. Increasing the mass ratio of waste glass has been shown to affect the compressive strength and hardness of the mortar. Regarding thermal conductivity and water absorption, these values decrease as the glass grows and have a positive effect.

Harish et al (2016) Research on using glass powder to partially replace cement in concrete. Increase the glass content in mortar to above 30% to reduce compressive strength. The average compressive strength of concrete containing glass powder with a size of less than 150 µ will increase up to 30% to replace cement. The average compressive strength of concrete containing glass powder with a size of less than 300µ will gradually decrease. The average tensile strength of concrete containing glass powder with a size of less than 150 µ will increase by up to 30% compared to cement replacement. The average tensile strength of concrete containing glass powder with a size of less than 300µ will gradually decrease when replacing 30% of cement.

Rahman and Uddin (2018), studied about the When waste glass was used in place of cement and fines, the values for bending and breaking resistance increased to a particular level. However, as the amount of waste glass is increased, the resistance value decreases. Tensile strength increases by 5% when waste glass is replaced by 10%, but decreases by 14% when waste glass is replaced by 30%.

Kalakada and Zameer et al (2019), investigates the mechanical and durability characteristics of concretes constructed with glass powder replacing cement (0%–50%). According to preliminary results, 30% is the best replacement level since it has strengths that are relatively equivalent to ordinary concrete, is easier to work with, and has a higher resistance to chloride ion penetration.

Antonio Bouty And Farah Homsi (2021), Investigated the replacing part of cement with used glass powder (0% to 25%). The compressive strength of concrete cubes at 7, 14 and 28 days decreased with increasing GWP%. Tensile strength decreases as the ratio of cement replaced by GWP increases. The water absorption capacity of 10% GWP concrete mixture increased by 17.8% compared to conventional mixture.

Rashid Islam and Manish Kaushal (2022) Studied about the cement was replaced with waste glass powder at a ratio of 0 to 30% by weight. The smaller particle size of the glass powder is more reactive to lime, resulting in higher compressive strength in the concrete mix. Compared with fly ash concrete, finer glass powder concrete has slightly higher initial and subsequent strengths. Water absorption coefficient testing also shows that incorporating finer glass powder improves durability. Glass powders ranging in size from 150 µm to 100 µm represent the onset of alkaline fusion.

Sameer Sawarkar (2022) Glass powder replacement for cement (0%–30%) has been studied.The compressive strength of concrete diminishes when the quantity of glass powder in concrete rises to 25%. The bond strength is anticipated to progressively rise until it reaches 25%, at which point it is anticipated to begin to decline. Tensile strength appears to improve initially before declining by 20%. Additionally, it has been discovered that utilizing glass powder in place of cement increases the material's tensile and compressive strength.

3. LITERATURE SUMMARY

From this review the change in concrete materials reflects the changes in concrete properties. Thus, the change in concrete is mainly due to environmental conditions such as time, temperature, chemical degradation due to acid attack, etc. The structure of concrete varies according to its constituents such as cement, aggregates and water content. The microstructure of concrete can also be modified by replacing concrete ingredients with other wastes and cheap by-products that are more useful in producing durable, high-performance concrete. Many studies on micro-concrete containing appropriate proportions of industrial waste show superior mechanical and durability compared to conventional micro-concrete. This article review found that the change in concrete materials reflects the changes in concrete properties. Thus, the change in concrete is mainly due to environmental conditions such as time, temperature, chemical degradation due to acid attack, etc. The structure of concrete varies according to its constituents such as cement, aggregates and water content. The microstructure of concrete can also be changed by replacing concrete ingredients with other wastes and cheap by-products that are more useful in making durable high-tech concrete. Many studies on micro-concrete containing appropriate proportions of industrial waste show superior mechanical and durability compared to conventional micro-concrete.

4. CONCLUSION

Micro-concrete can also be modified by replacing concrete ingredients together with other inexpensive wastes and by-products are more useful in producing durable, high-performance concrete. Many micro-concrete studies with a combination of industrial waste in proper proportions for better performance in mechanical properties and durability compared to conventional micro-concrete

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