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A Review Paper on Experimental Study of Effect on Concrete Properties with Partial Replacement of Cement with Dolomite Powder

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Abstract: ***Concrete is a building material consisting of cementations material, fine aggregate, coarse aggregate and water Presently a days the value of those materials are accrued thus, we would like to appear at the simplest way to decrease value of building materials generally cement one in every of the modern development in housing industry is additional of materials in concrete. The partial replacement of materials reduces price, energy savings and protection of environment. To reach these we are partially swapping the cement with marble powder produced from marble industries. Progressive concrete technology becomes advanced to the concrete properties. This paper current and mechanical property of concretes made with and dolomite powder as cement replacement in different amounts. Research in this field and progressive results are essential so as to continue all developments with minimum damage to surrounding environment and tracking down all infrastructures for services and convenience which are preferred to get.***

Keywords: Concrete, Concrete Properties, Dolomite powder, Replacement, Environment.

I. INTRODUCTION

Concrete is the simple civil engineering material used in most of the civil engineering structures. Many materials are used to manufacture good quality concrete. Cement, fine Cement is one of the most important constituents of concrete. Most of the properties of concrete depend on cement. Cement is manufactured by calcimine argillaceous and calcareous materials at a great temperature. During this process, huge amount of CO^2 is released in to the earth atmosphere. India is the second largest manufacturer of cement in the world. It is estimated that the manufacture of one ton of cement outcomes in the emission of 0.79 ton of CO2. The drop in the consumption of cement will not only decrease the cost of concrete but also the emission of CO^2. Dolomite powder developed by grinding the sedimentary rock creating mineral dolostone can be used as a replacement material for cement in concrete up to certain percentage. Dolomite powder has some similar physical characteristics of cement. Dolomite is a carbonate material composed of calcium magnesium carbonate CaMg $(CO3)_2$. Dolomite is a rock forming mineral which is noted for its significant wettability and dispensability. Dolomite has a good weathering resistance. Dolomite is a preferred for construction material due to its higher surface hardness and density. The strength properties of concrete with partial replacement of cement with dolomite powder is to be examine, because of dolomite has same configuration as of the cement such as dolomite has same specific gravity as cement and also finesse, because the properties it can be good replacement of cement in construction industry.

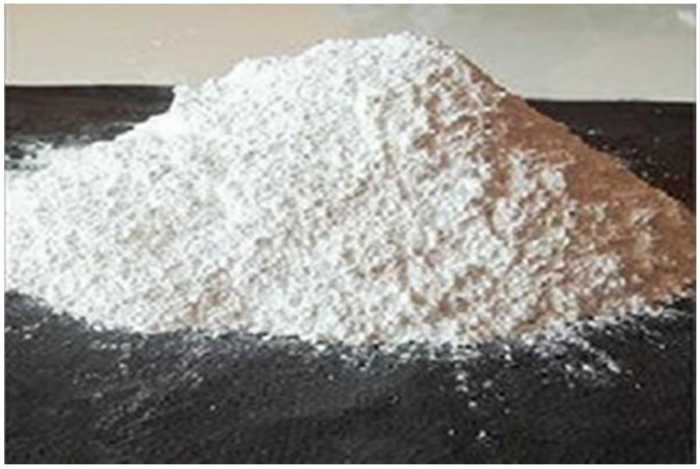

Figure-1: Dolomite powder (Ref: Anonymous)

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II. LITERATURE REVIEW

A. Muthukumaran et al (2017) [1]:- Concrete i s a mixture e of cement, fine aggregate, coarse aggregate and water. Advanced concrete technology more improved to the concrete properties like strength, durability, workability, flow ability. This paper fresh and hardening property of concretes mad e with m-sand as cement and dolomite powder as cement replacement in different a mounts. The experimental studies on physical and micro structural properties of manufacture d sand is presented in this chapter. While comparing the properties of natural sand (spherical particles), the manufactured sand (angular particles) gives s better interlocking between the particles and hence enhancement in strength and durability characteristic s may be obtained. For this study, three mixtures were prepared with a constant water-to-powder ratio and powder content. Fresh concrete properties were assessed by means of slump test and compaction factor test, while hardened properties were evaluated by means of compressive strength at ages of 7, and 28 days

Viktor Vaganov et al (2016) [2]:- The article discusses possibilities for creating sustainable concrete compositions from local dolomite raw materials. In the first part of the article, practical examples of the use of dolomite quarry by-products (siftings) as a component of concrete mixes are summarized. The second part of article presents experimental study on obtaining caustic dolomite. This method allows obtaining the product with higher added value. Local dolomite raw materials are used and appropriate regimes of thermal treatment have been tested.

Shindon Baby et al (2016) [3]:- Cement and coarse aggregate are two important constituents of concrete. Several studies were conducted to find an effective replacement for these raw materials of concrete with different goals such as reduced cost and high strength. Replacement of cement with a more environment friendly will help to reduce the emission of carbon dioxide gas into the atmosphere and using a waste material in place of coarse aggregate will help to reduce the environment pollution. This study aims to create a better concrete in low cost and is focused on the compressive strength of the concrete by partially replacing cement with dolomite powder and coarse aggregates with crushed tiles. The obtained results are analyzed and the optimum mix with maximum strength is determined.

Suchith Reddy Arukala et al (2015) [4]:- Concrete is a construction material consisting of cementations material, fine aggregate, coarse aggregate and water. Now a days the cost of these materials are increased so, we need to look at a way to reduce the cost of building materials especially cement. One of the recent advancement in construction industry is replacement of materials in concrete. The replacement of materials offers cost reduction, energy savings and protection of environment. To achieve the above objective we are partially replacing the cement with waste marble powder (WMP) produced from marble industries. The present investigation is aimed to study the fresh and hardened properties of concrete when cement is partially replaced by waste marble powder. The work is focused on M_{20}, M_{30}, M_{40} grades of concrete. The percentage of Waste marble powder that replaced cement in this investigation are 0%,5%,10%, 15% and 20% .The fresh proprieties are workability and hardened properties are compressive strength at the age of 7,28 days of curing, split tensile strength, and flexural strength of concrete are at the curing age of 28days are to be determined. Results shows that the workability and compressive strength, flexural, and split tensile strengths of concrete are increased with partial replacement of cement by waste marble powder between 10% to 15%.

Yang Huamei et al (2015) [5]:- Combined with DTG analysis, X-Ray diffraction analysis (XRD) and field emission scanning electron microscopy analysis (FSEM) affiliated with energy dispersive spectrometer analysis (EDS), the early hydration and carbonation behavior of cement paste compacts incorporated with 30% of dolomite powder at low water to cement ratio (0.15) was investigated. The results showed that early carbonation curing was capable of developing rapid early strength. It is noted that the carbonation duration should be strictly controlled otherwise subsequent hydration might be hindered. Dolomite powder acted as nuclei of crystallization, resulting in acceleration of products formation and refinement of products crystal size. Therefore, as for cement- based material, it was found that early carbonation could reduce cement dosages to a large extent and promote rapid strength gain resulting from rapid formation of products, supplemental enhancement due to water release in the reaction of carbonation, and formation of nanometer CaCO3 skeleton network at early age.

Preethi G et al (2015) [6]:- Cement is one of the most important constituents of concrete. Most of the properties of concrete depend on cement. Cement is manufactured by calcining argillaceous and calcareous materials at a high temperature. During this process, large amount of CO_2 is released in to the atmosphere. India is the second largest producer of cement in the world. It is estimated that the production of one ton of cement results in the emission of 0.8 ton of CO_2. The reduction in the consumption of cement will not only reduce the cost of concrete but also the emission of CO_2. Dolomite powder obtained by powderising the sedimentary rock forming mineral dolostone can be used as a replacement material for cement in concrete up to certain percentage. Dolomite powder has some similar characteristics of cement. Using dolomite powder in concrete can reduce the cost of concrete and may increase the strength to some extent. This paper examines the possibility of using dolomite powder as a partial replacement material to cement.

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The replacement percentages tried were 0%, 5%, 10%, 15%, 20% and 25% by weight of cement. The compressive, split tensile and flexural strengths of concrete with dolomite powder were compared with those of the reference specimens. The results indicate that replacement of cement with dolomite powder increases the compressive, split tensile and flexural strengths of concrete.

Ivan Gabrijel et al (2015) [7]:- This paper addresses fresh and hardening properties of self-compacting concretes (SCC) made with dolomite filler and pozzolanic materials, fly ash and mate kaolin as cement replacement in different amounts. For this study, seven mixtures were prepared with a constant water-to-powder ratio and powder content. Fresh SCC properties were assessed by means of slump flow, L-box and sieve segregation test, while hardened properties were evaluated by means of compressive strength and modulus of elasticity at ages of 2, 7, 14, 28 and 365 days. In addition, the activity of mineral additives was assessed by heat of hydration measurement. Obtained results showed that mixtures containing fly ash exhibited better performance concerning workability properties needed for SCC, while cement replacement with met kaolin enhanced the mechanical properties. Slower pozzolanic activity of fly ash reflected in slower strength development, but ultimate strength obtained at the age of 365 days was not reduced by the presence of fly ash.

Malay M. Patel et al (2014) [8]:- Today construction cost is very high with using routine material like cement, fine aggregate and coarse aggregate. This study includes use of different waste material as a partial replacement of cement or fine aggregate or coarse aggregate. Industries in India produce lots of waste which may be useful in partial replacement of all the raw materials due to their different properties so hereby we studied as many useful research papers in this field and trying to improve with locally available waste material so it can be proved economical as well. Research in this field and positive results are crucial so as to continue all developments with least damage to surrounding environment and obtaining all infrastructures for services and convenience which are desired to get.

Deepa Balakrishnan S et al (2013) [9]:- Advancements in technology demand many improved properties to the concrete like workability, flow ability, higher strength, durability etc. To overcome the difficulties like low workability and low flow ability, a new form of concrete designated as Self Compacting Concrete (SCC) was developed in 1988 by Okamura in Japan. Self-compaction is described as the ability of the fresh concrete to flow under its own weight over a distance without segregation and without using vibrators to achieve proper compaction.

Sufficient number of investigations is necessary to get a clear idea about the factors affecting the strength, durability and long term behavior of SCC with additives like fly ash and dolomite powder. In this paper, high volume fly ash self-compacting concrete was produced with 12.5percent , 18.75percent , 25percent , and 37.5percent of the cement (by mass) replaced by fly ash and 6.25percent , 12.5percent and 25percent of the cement replaced by dolomite powder.

For these mixtures compressive strength (cube) was studied at 7thday, 28th day and 90th days with same water powder ratio (0.33). The test results for acceptance characteristics of self-compacting concrete such as slump flow test, J-ring test, V-funnel test and L-box test are presented.

The mixes were then tested for other mechanical properties like, cube compressive strength at 7th day, 28th day, and 90th day, cylinder compressive strength at 28th day, split tensile strength, and flexural strength at 28th day. For all levels of cement replacement concrete achieved superior performance in the fresh and mechanical tests compared with the reference mixture.

Baboo Rai et al (2011) [10]:- In this paper the effect of using marble powder and granules as constituents of fines in mortar or concrete by partially reducing quantities of cement as well as other conventional fines has been studied in terms of the relative workability & compressive as well as flexural strengths. Partial replacement of cement and usual fine aggregates by varying percentage of marble powder and marble granules reveals that increased waste marble powder (WMP) or waste marble granule (WMG) ratio result in increased workability and compressive strengths of the mortar and concrete

III. CONCLUSION

By reviewing all this literature studies we came to conclusion that there is a number of published works on strength of concrete with replacement of cement with dolomite, the replacement is in partial format, because of this the strength of concrete is increased up to some extend as mentioned in above published paper strength of concrete is increased for certain amount replacement of dolomite with cement further replacement of dolomite leads decrease in strength of concrete, however the less effort on microscopic structure of concrete on replacement of dolomite and differential thermal analysis (DTA-TGA) is found out during the study of literature. The SEM test should be done for microscopic structure of the concrete when the cement is replaced partially with dolomite powder. However the thermal analysis is helpful for the measuring the heat changes associate with physical and chemical transformation occurring during the gradual heat of substance

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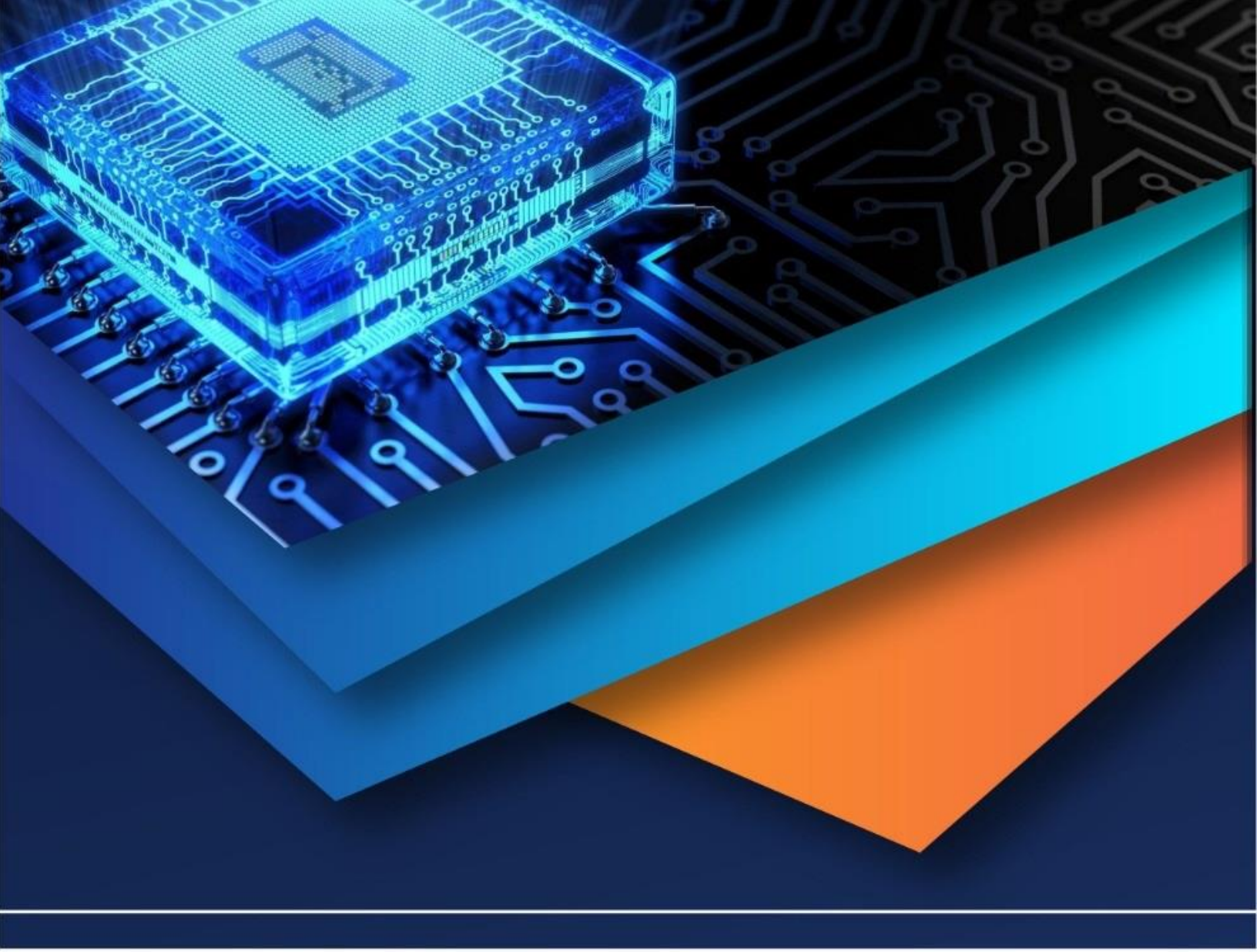

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