A Brief Review on Nano Minerals

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ABSTRACT
Nanotechnology is rapidly becoming the Industrial Revolution of 21st century while compared to other technologies; nanotechnology is much less well-defined and well-structured. Until today, concrete has primarily been seen as a structural material. Nanotechnology is helping to make it a multipurpose “smart” functional material. Concrete can be nano-engineered by the incorporation of nano-sized building blocks or objects e.g., (nano particles, nano admixtures and nanotubes) to control material behavior and grafting of molecules onto the cement particles, cement phases, aggregates, and additives (including nano-sized additives) to provide the surface functionality adjusted to promote the specific interfacial interactions of the molecules. In this project the properties of Nano materials were studied and their effect of strength and durability where studied. Nano silica and Nano cement based concrete where found to be more durable and their compressive strength where equal to conventional concrete

Keywords--- Nano, Blocks, SF

I. INTRODUCTION

Generally, cement is a binder that sets and hardens independently and binds other materials together. Cement mortar is made up of mixing fine aggregate, cement with specified amount of water. Mortar has been used for centuries as a means of adhering bricks or concrete blocks to one another. Cement mortar continues to be used in many different types of construction such as binder between bricks in walls, fences, and walkways, to make quick repairs in patio slabs and reset loosened stones or bricks in a walkway or retaining wall. Normally, construction industry is one of the largest consumers of natural resources and energy, it is responsible for large emissions of green house gases (GHGs) and large amount of carbon dioxide which responsible for global warming. Studies show that one ton of Portland cement clinker produces one ton of GHGs. In addition, due to the accumulation of natural aggregate extraction from quarries; it is an immediate concern for sustainable construction development.

II. LITERATURE REVIEW

Anwar M. Mohamed. This paper has studied the mechanical properties of different mixtures of nano which includes nano silica and nano clay or both at various ratios. Mechanical properties like compressive strength and flexural strength had been investigated. The final result shows that the nano silica is more effective than nano clay while wet mix gives higher efficiency than dry mix.

Rajkumar et al., studied the improvement of the mechanical and durability properties of concrete because it gets damaged when exposed to seving the complex structural of cement based materials at nano level will lead to a new generation of concrete that is stronger and more durable with stress-strain behavior. Its properties include electrical conductivity, temperature, moisture and stress-sensing abilities. Therefore application of nano materials in concrete technology can give a facelift for construction infrastructure. This paper attempts to strengthen the characteristics of concrete by adding nano silica where nano acts as a filter to improve the microstructure and also acts as an activator to promote pozzolanic reaction which increases the durability and mechanical property of the mix. It provides way for a crack free concrete towards sustainable construction.

Abdullah Keyvani et al., concluded that use of nanofibres is considered to be significant in nanotechnology. It possess high strength and thermal conductivity where it has an ability to store nanoparticles inside the tubes. Concrete and nanofibres together produce a tougher concrete that prevents crack formation. Carbon nanotubes enhances the strength, hinder crack formation in cement composites and it acts as a nucleating agent. Novel
innovations in technology show that it is possible to distribute carbon nanofibres bundles across cement grains. Another application of nano technology in concrete is embedding wireless nano electron mechanical systems devices into concrete to measure concrete density and viscosity, temperature, moisture content, shrinkage stresses, pH chloride concentration and carbon dioxide are the potential application of nanotechnology in concrete material.

**JEMIMAH CARMICHAELM et al., [2012]**

In this paper “INFLUENCE OF NANO MATERIALS ON CONSISTENCY, SETTING TIME AND COMPRESSIVE STRENGTH ON CEMENT MORTAR”. He conducted test on consistency, setting time and compressive strength on cement mortar. With replacement of nano-cement (NC), nano-fly ash (NFA) and nano-silica fume (NSF). Finally he concluded that consistency is not affected due to the presence of nano materials. The setting time and the compressive strength are influenced by the presence of nano materials to a greater extent. It is found that addition of nano-cement decreases the initial and final setting time of the cement mortar whereas addition of nano flyash and nano-silica fume increases the initial and final setting time.

**SAVED ABD EL-BAKY et al.,**

In this paper “INFLUENCE OF NANO-SILICA ADDITION ON PROPERTIES OF FRESH AND HARDENED CEMENT MORTAR” the properties on fresh and hardened concrete with nano-silica were experimentally studied in addition to measuring by SEM analysis. In addition, the scanning electron microscope (SEM) analysis of the microstructures showed that the nano silica filled the cement paste pores, more homogeneity for cement paste and interfacial zone, by reacting with calcium hydroxide crystals forming more calcium silicate hydration.

**SALOMA et al., [2013]**

In this paper “EXPERIMENTAL INVESTIGATION ON NANOMATERIAL CONCRETE” the mechanical behavior of the concrete were studied. He replaced nanosilica as a partial substitution of cement in concrete. The presence of nanosilica in concrete results the byproduct of the cement hydration production in the form of free hydroxide calcium. Nanosilica will react with C3S and C2S in the cement and produce CSH-2 that will form a strong bond. The results showed that the addition of nanosilica as cement partial substitute material which improves the mechanical behavior of the concrete.

**SADMOMTAZI et al.,**

In this paper “INVESTIGATION OF MECHANICAL AND PHYSICAL PROPERTIES OF MORTARS CONTAINING SILICA FUME AND NANO-SIO2” conducted test on mechanical properties, shrinkage, water absorption of the specimens. An influence on nano-SiO2 on different properties of cement mortar was investigated in comparison with silica fume (SF) as a well-known active pozzolan. Different amounts of nano-SiO2 (0, 1%, 3%, 5%, 7%and 9%) were incorporated with ordinary cement mortar. Results showed that the optimal content of Nano-SiO2 in plain cement mortar was around 7%. Nano-SiO2 particles were more effective in developing higher mechanical strength and lower water absorption than that of SF. Yet the mortar containing nano-SiO2 experienced higher shrinkage than that of SF mortar.

**BIBHUTI BHUSAN MUKHARJEE et al., [2014]**

In this paper “INFLUENCE OF NANO-SILICA ON THE PROPERTIES OF RECYCLED AGGREGATE CONCRETE”. The presented work addresses the effect of incorporation of colloidal Nano-Silica on the behavior of concrete containing 100% recycled coarse aggregate. In that study, concrete mixes containing both natural and recycled aggregate are produced by replacing a fraction of Portland cement 0.75%, 1.5% and 3% of colloidal Nano-Silica respectively. The result of experimental investigation depicts that compressive strength, tensile strength and Non-Destructive parameters are enhanced due to addition of NS. Moreover, the study reveals that the characteristics of recycled aggregate concrete resembles with that of natural aggregate concrete with the addition of little amount (3%) of Nano-Silica.

**HONGJIAN DU et al., [2014]**

In this paper “DURABILITY PERFORMANCES OF CONCRETE WITH NANO-SILICA”. This study investigated the durability properties of concrete containing nano-silica at dosages of 0.3% and 0.9%, respectively. Due to the nano-filler effect and the pozzolanic reaction, the microstructure became more homogeneous and less porous, especially at the interfacial transition zone (ITZ), which led to reduced permeability. Test on the durability properties verified the beneficial effects of nano-silica.

**C. K. SRIDHAR et al., [2014]**

In this paper “STRENGTH EFFICIENCY FACTOR FOR NANO SILICA AT DIFFERENT AGE”. This paper reveals the experimental study to evaluate strength of hardened concrete and strength efficiency factor ‘K’ for Nano silica by replacing the cement by various percentages of Nano silica (0.25% to 2.5% by weight of cement) for M20, M40 concrete at 7 & 28 days of curing. Modified Bolomey equation is used for determination of strength efficiency factor. From this study, it can be concluded that the optimum replacement of Nano Silica is 2% and 1.5% respectively for M20&M40 concrete. The mode value of ‘K’ is 6.0, 6.64 for 7 & 28 days respectively of M20 concrete, similarly 5.83, 5.94 for 7 & 28 days respectively of M40 concrete.

**SIVA SAI et al., [2013]**

In this paper “COMPARATIVE STUDIES ON HIGH STRENGTH CONCRETE MIXES USING MICRO SILICA AND NANOSILICA”. He investigated...
on the strength of M60 and M70 concretes with the use of micro silica along with colloidal nano-silica which was used to study the mechanical properties. It was found from the experimental investigation that concrete composites with superior properties can be produced with the combination of micro-silica and nano-silica.

III. CONCLUSION

The mechanical properties (i.e.) compressive strength of cement mortar and concrete incorporated with NANO materials has shown good performance. The durability properties of slag based materials were excellent when compared to normal concrete.

REFERENCE