Characteristic Study of Concrete Using Nano Particles

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***Abstract* - The recent researches on Nano materials and nano technologies have highlighted the potential use of these materials in various fields such as medicine, construction, automobile industry, etc., this is due to special characteristics of materials at the nano scale. Building materials domain can be one of the main beneficiaries of the researches, with applications that will improve the characteristics of concrete and steel, glass and insulating materials. Improving the material resistance and increasing of their durability will reduce environmental pollution by reducing the carbon footprint of the building. In this present study by using nano particles (nano-silica and titanium dioxide) which leads to densifying of the micro and nanostructure resulting in improved mechanical properties. The addition of Sio2 and Tio2 with several weights with represents to cement improves excellent mechanical properties of concrete. In these we had added 0.1, 0.125, 0.25, 0.5, 0.75 and 1 percentage of Sio2and Tio2. Nano-silica addition to cement based material can also control the degradation of the fundamentals C S H (Calcium Silicate Hydrate) reaction of concrete caused by calcium leaching in water as well as block water penetration and therefore lead to improvements in durability.**

***Keywords* - Nano material, Nanotechnologies, Structural behavior, Sio2 and Tio2.**

I. INTRODUCTION

Nanotechnology is the re-engineering of materials by controlling the matter at the atomic level, basic physics and chemistry research, where the phenomena on atomic and molecular levels are used to provide materials and structures that perform tasks that are not possible using the materials in their typical macroscopic form.

Nanotechnology is the use of very small pieces of material by themselves or their manipulation to create new large scale materials. At the Nano-scale material properties are altered from that of larger scales. The Nano-scale is the size range from approximately 1nm to 100nm. Nanotechnology is an enabling technology that allows us to develop

Materials with improved or totally new properties.

II. OBJECTIVES

By using the silicon dioxide (Sio_2) and Titanium dioxide (Tio_2) we have find out the compressive strength of the concrete for 7 days and 28 days with different percentages.

II. ADVANTAGES

- Lighter and stronger structural composites
- Low maintenance coating
- Improving pipe joining materials and techniques.
- Better properties of cementations materials
- Reducing the thermal transfer rate of fire retardant and insulation
- Increasing the sound absorption of acoustic absorber
- Increasing the reflectivity of glass.

III. RESULTS

By using the pycnometer the specific gravity of the material has been determined. By making the water cement ratio as 0.48, the 7days and 28 days compressive strength of concrete at different% of nano silica and nano titania has been achieved as 3 – 5 times of conventional concrete.

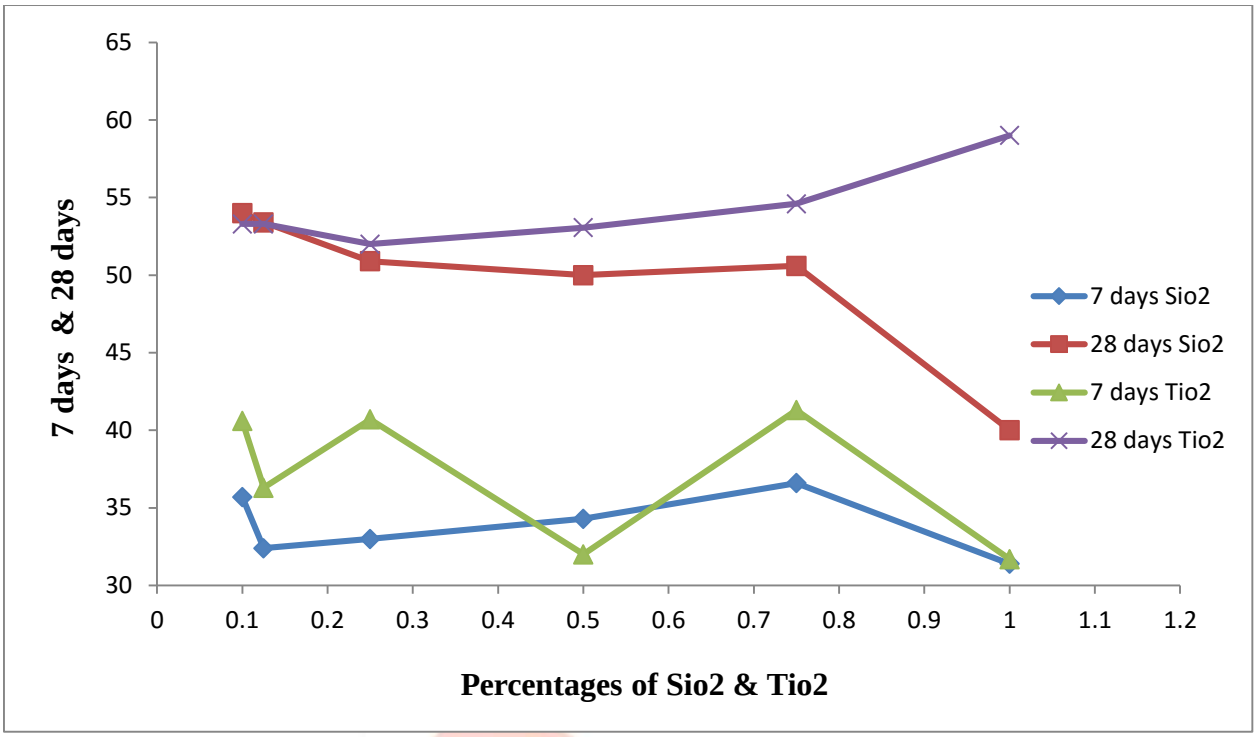
NANO PARTICLES

Table 1: Average compressive strength of Sio_2

S.NO.	SIO_2 AVERAGE COMPRESSIVE STRENGTH N/mm^2											
	0.1%		0.125%		0.25%		0.5%		0.75%		1%	
	7D	28D	7D	28D	7D	28D	7D	28D	7D	28D	7D	28D
1	35.01		32.8		35.2		34.0		36.0		31.8	
2	36.01		32.4		32.0		35.01		37.01		31.0	
3	36.01		32.0		32.0		34.0		37.0		31.6	
4		54.01		53.06		50.91		50.0		52.01		40.0
5		56.01		54.01		50.91		50.0		50.01		40.01
6		52.01		53.06		50.91		50.0		50.01		40.01
AVG	35.7	54.0	32.4	53.4	33.0	50.9	34.3	50.0	36.6	50.06	31.4	40.01

Table 2: Average compressive strength of Tio_2

S.NO.	TIO_2 AVERAGE COMPRESSIVE STRENGTH N/mm^2											
	0.1%		0.125%		0.25%		0.5%		0.75%		1%	
	7D	28D	7D	28D	7D	28D	7D	28D	7D	28D	7D	28D
1	42.01		37.01		42.0		32.0		42.01		32.41	
2	40.01		36.01		38.0		32.0		40.01		32.41	
3	40.01		36.01		42.0		32.0		42.0		30.55	
4		54.01		53.06		52.1		53.06		56.01		59.06
5		50.01		54.01		52.1		53.06		54.0		59.0
6		56.01		53.06		52.01		53.06		54.01		59.06
AVG	40.6	53.3	36.3	53.3	40.7	52.0	32.0	53.0	41.3	54.6	31.7	59.0



Graph 1: 7- days & 28 days Compressive StrengthSio_2 Vs Tio_2 (0.1, 0.125, 0.25, 0.5, 0.75, 1%)

IV .CONCLUSION

- Concrete cubes are casted for M20 grade concrete with and without addition of nano-particles.
- Two varieties of nano-particles are used for testing the compressive strength.
- Nano particles Sio2& Tio2 are added to the normal concrete by various % by weight of cement.(0, 0.1, 0.125, 0.25, 0.5, 0.75 and 1.0 %)
- 7 days & 28 days Compressive strength of concrete testing data were plotted &observed.

For Sio2

- 7- Days compressive strength is gradually increasing up to 0.75% later decrease
- After adding 1% of Sio2 there is not much change in strength of concrete.
- 28- Days compressive strength is also increasing up to 0.75% later decreases for
- The maximum percentage of 0.75% the 28-day compressive strength is
- Optimum content of Sio2 is restricted as 0.75%.

For Tio2

- 7- Days compressive strength is alternate increase and decrease were observed.
- Up to 0.25% of Tio2 there is not much change in 28-day strength of concrete.
- 28- Days compressive strength is increasing after 0.25% of Tio2 and is observed as 59N/mm^2

V.REFERENCES

[1] Patel Abhiyan S., Rathod Hiren A., Neeraj SharmaD. (2013), an overview on Application of Nanotechnology in Construction Industry, International Journal of Innovative Research in Science, Engineering and Technology, Vol. 2, Issue 11,November 2013.

[2] Zhi Ge and Zhili Gao (2008) Applications of Nanotechnology and Nanomaterials in Construction, "First International Conference on Construction in Developing Countries", August 4-5, 2008.

[3] A.A. Maghsoudi and F. Arabpour Dahooei (2009), application of nanotechnology in self compacting concrete design, Archive of SID Vol. 22, No. 3, October 2009 – 229.

[4] Saurav (2012) Application of nanotechnology in building materials, International Journal of Engineering Research and Applications , Vol. 2, Issue5, September- October 2012, pp.1077-1082.

[5] B. Bhuvaneshwari, Saptarshi sasmal, Nagesh r.iyer Nano science to Nanotechnology for Civil Engineering – Proof of Concepts, Recent Researches in Geography, Geology, Energy, Environment and Biomedicine.

[6] V.Kartik Ganesh, Innovations in the Methodology of Usage of Nanomaterials in Civil Engineering Works, International Journal of Software and Web Sciences.

[7] Amit Srivastava and Kirti Singh (2011), nano technology in civil engineering and construction: a review on state of the art and future prospects, Proceedings of Indian Geotechnical Conference,December 15-17, 2011, Kochi (Paper No.R-024)