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Experimental Study on Concrete By Partial Replacement of Cement With Micro silica And Nano Silica

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Abstract: **Portland cement concrete is probably the mostly used man made material in the world. Also concrete production is one of the concerns worldwide that impact the environment with global warming due to carbon dioxide emission during production of cement. Also many other environmental issues are associated with the production of Portland cement, alternate materials should be found out. There are many other materials which have binding property like cement. So, we can use such materials by replacing and by partial replacing. Various and separate materials are known as additional binding materials are added to concrete to improve its features. All around utilization of silica fume exceeds 1 million tons per annum. It is identified as a pozzolanic and binding admixture which is effective in embellish the mechanical properties to a great extent. Micro silica in concrete donate to stamina and stability for overtime.**

Keywords: **Microsilica, Nanosilica, Cementitious, Pozzolanic**

I. INTRODUCTION

Concrete is absolutely indispensable in modern society's attraction with new roads, buildings and other constructions. The present utilization of concrete is estimated in the world is 10 billion tones (12 billion tones) every year. The structural concrete elements can be formed into a variety of shapes and sizes. This is because recently made concrete is of a plastic consistency, which permits the material to flow into prefabricated formwork. After a number of hours, the formwork can be removed for rework when the concrete has set and hardened to a strong mass. Concrete is available at low cost and also freely. The three basic ingredients of concrete are aggregate, cement, water. One of the main ingredients of concrete mixture is ordinary portland cement which is the second most worked material after water. Due to the production of cement carbon dioxide emission result and due to carbon dioxide global warming result which is not good for atmosphere. Around 1.35 billion tones of green house gas emission is contributes by global cement industry annually. For production of cement it also requires more energy and common resources and due to all this various environmental issues. Cement is mostly utilized for construction in present time because of its need but side by side its drawbacks to environment also require attention. So, for saving our environment this is the try to replace the cement with nanosilica and microsilica. By these natural resources replacement we can help to save environment. For this we have to do a experiments with available material whose price , goods are almost meet with our current construction materials . So, we can get a quality construction material.

II. EXPERIMENTAL PROGRAM:

Material Used:

1) **Cement:** We are using ordinary portland cement with 43 grade for casting of all the samples. It is the most frequently used cement in all constructions along with plain and reinforced cement concrete, brick and stone masonry, floors and plastering.
2) **Fine Agregates:** Silty sand is used. Fine aggregates are the aggregates whose size is less than 4.75mm.
3) **Coarse Aggregate :**Locally available coarse aggregate with maximum size of 10- 20 mm were used.
4) **Microsilica:** Powder form silica fume is used and extremely very fine particle.(size 10^{-6})
5) **Nanosilica:** It is used in very little ratio and it is also very fine.(size10^{-9})
6) **Water:** Potable water is generally considered satisfactory for concrete as per Indian standard code, IS 456-2000. Water should be free organic matters, salts and other impurities.

III. EXPERIMETAL WORK

In this study, compressive strength, tensile strength and flexural strength was measured as per recommendation

of IS:516-1959 .For testing the compressive strength of concrete, 36 cubes of 150mm X 150 mm X 150 mm dimensions were casted and tested for each parameter 18 specimens for 7 days curing and other for 28 days curing. The compressive strength of concrete is measured at 7 and 28 days. For split tensile strength 36 cylinder of size 200mmX100mm were casted and tested. Flexural strength test was carried out by casting 36 beams of size 100mm X 100mm X 500mm.

Mix Proportion:

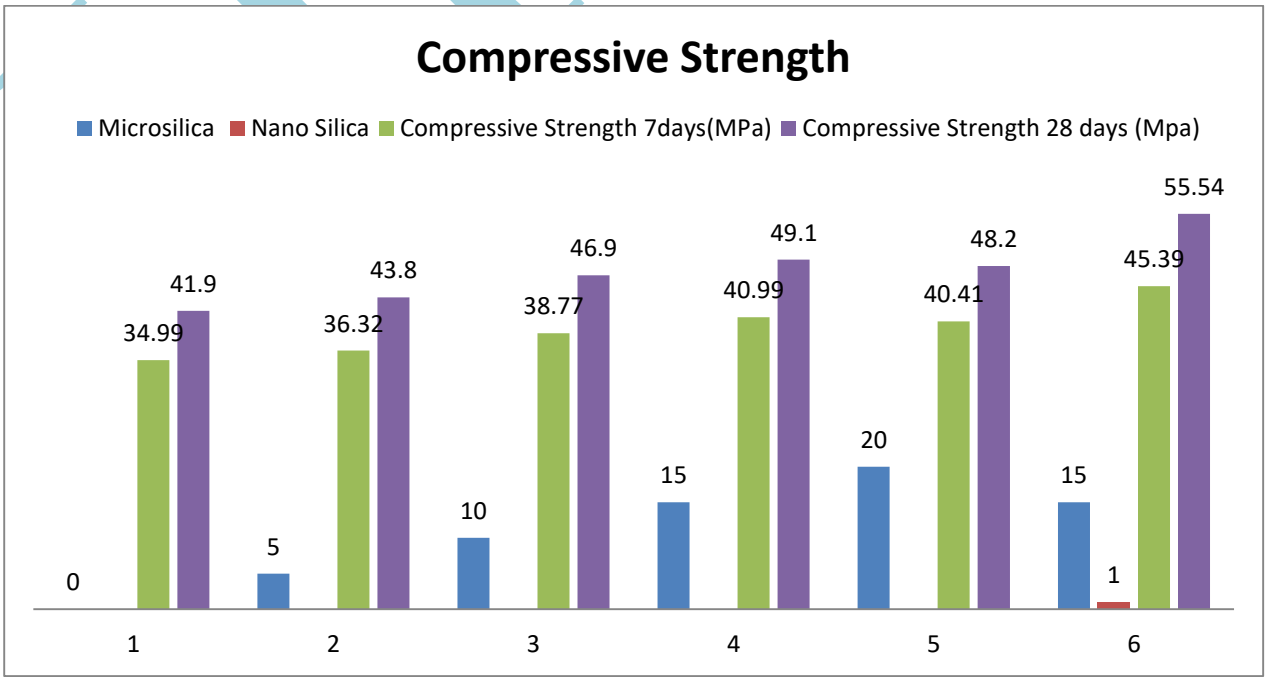
Silica based concrete M40.

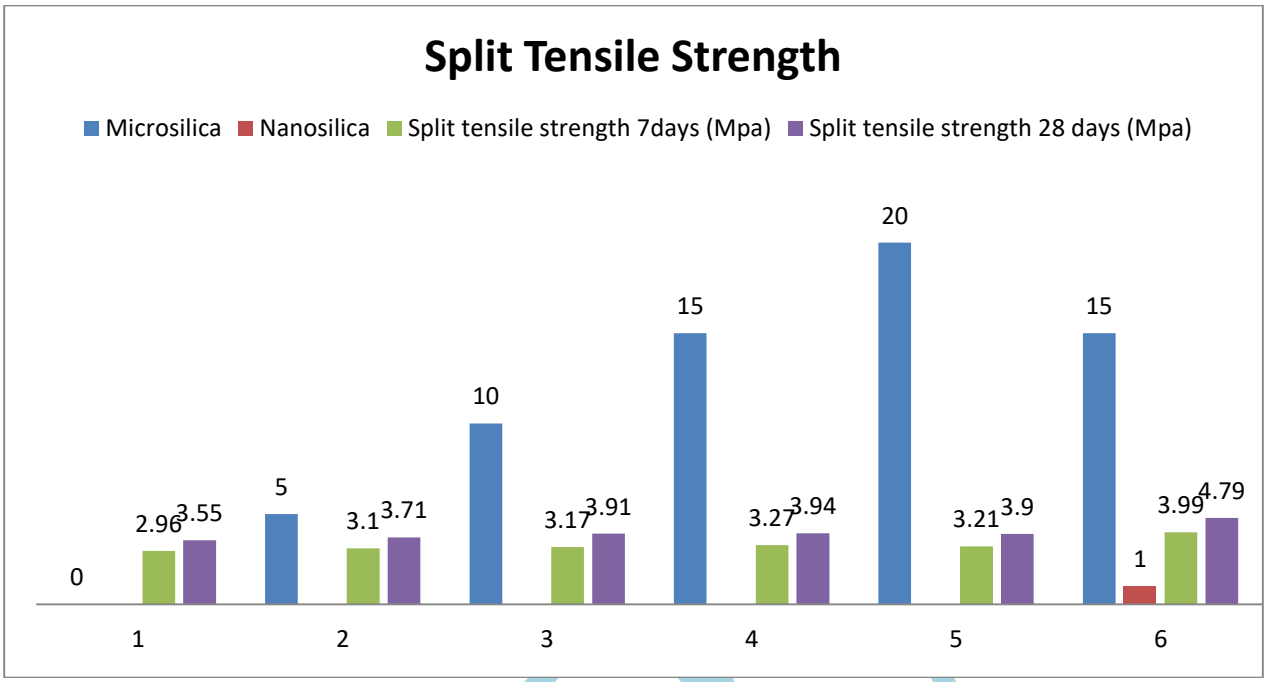
IV. RESULTS

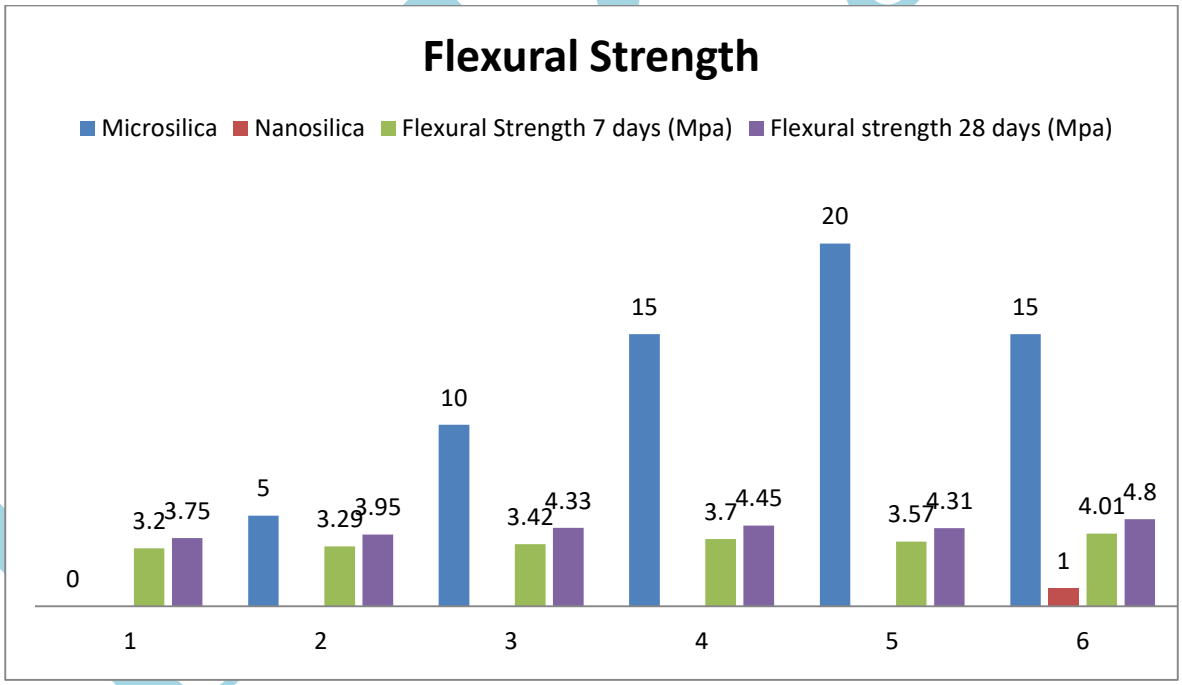
S.No	Percentage replacement (Microsilica	Average Compressive Strength 7Days (N/mm^2)	Average Compressive Strength 28Days (N/mm^2)	Split tensile Strength 7Days (N/mm^2)	Split tensile Strength 28(N/mm^2)	Flexural Strength 7Days (N/mm^2)	Flexural Strength 28Days (N/mm^2)
1	0%	34.99	41.9	2.96	3.55	3.20	3.75
2	5%	36.32	43.8	3.10	3.71	3.29	3.95
3	10%	38.77	46.9	3.17	3.91	3.42	4.33
4	15%	40.99	49.1	3.27	3.94	3.70	4.45
5	20%	40.41	48.2	3.21	3.90	3.57	4.31

In this whole experiment we find that the 15% is optimum value for replacement because it gives us the maximum strength, so for further more experiment we add a little ratio of nanosilica in this optimum percentage and we got more higher strength.

S.No	Percentage replacement (Microsilica	Percentage replacement (Nanosilica)	Average Compressive Strength 7Days (N/mm^2)	Average Compressive Strength 28Days (N/mm^2)	Split tensile Strength 7Days (N/mm^2)	Split tensile Strength 28(N/mm^2)	Flexural Strength 7Days (N/mm^2)	Flexural Strength 28Days (N/mm^2)
1	15%	1%	45.39	55.54	3.99	4.79	4.01	4.80







V. CONCLUSION

Based on results of the experimental investigation, following conclusions are drawn:-

a) The 7 days and 28 days maximum compressive strength,split tensile and flexural strength is obtained for 15% replacement of microsilica with cement but when we add 1% nanosilica with addition of optimum(15%) microsilica in this percentage we obtained maximum strength, even more incremental strength.

b) We have put forth a simple step to minimize the costs for construction with the usage of microsilica and nanosilica.

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