"A ROLE OF ZEOLITE IN CONCRETE"

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ABSTRACT

Concrete is used most preferably in construction field for their high compressive strength and its properties. In this field one of the disadvantages is carbon dioxide emission from the concrete and from manufacturing of cement. To overcome this issues zeolite material is introduced in concrete to absorb carbon dioxide from the environment and also to reduce the cement and natural river sand in construction. This study presents an experimentally investigation to evaluate the compressive strength, flexural strength and carbon dioxide adsorption of concrete with zeolite powder as partial replacement material. The cement is replaced with zeolite power by 0%, 10%, 20%. The concrete cubes and beams will be casted and tested at seven days, fourteen days and twentyeight days.

Keyword- *Zeolite; concrete; carbon dioxide.*

1. INTRODUCTION

Zeolites are microporous, aluminosilicate minerals commonly used as commercial adsorbents and catalysts. Zeolites occur naturally but are also produced industrially on a large scale. Every new zeolite structure that is obtained is examined by the International Zeolite Association Structure Commission and receives a three letter designation. Portland cement industry is responsible for approximately 7% of global CO2 emission. Global warming is now recognized by almost all scientists, and they recognize that humans are increasing the rate of global warming. Global warming has become a major concern of humanity since the middle of the 20th century.

2. OBJECTIVES

The following are the main objectives of the Utilization of zeolite inconcrete with CO2 adsorbing property.

- To determine the properties of materials used for zeolite concrete.
- To establish M40 grade concrete as the conventionalconcrete and zeolite concrete.
- To determine strength properties of conventional concrete and zeolite concrete.
- To measure and examine the carbon dioxide adsorbing properties by phenolphthalein test SEM analysis, EDX Result.

3. LITERATURE REVIEW

B.Uzal and L.Turanl (2012) studied the properties and hydration characteristics as well as paste microstructure of blended cements containing 55% by weight zeolite tuff composed mainly of clinoptilolite mineral were investigated. Super plasticizer requirement and compressive strength development of blendedcement mortars were also determined.

Lisa E. Burris et.al.(2016)investigate the natural property ie; physical and substance property of a natural zeolite should be tested as well as investigate the effects of acid treatment and also study the effects of physical, chemical properties then analysis the hydration process of zeolite and cement (replacement proportion) correlation of those parts composition and then to determine or find out it should bean effective method which it is going increasing

the strengthof the concrete by using supplementary cementitious of a natural zeolite. This paper the natural zeolite can be tested son the chemicals (mentioned in conclusion) & hydrochloric acid, nitric etc and by conducting some tests like Icp, laser particle size analysis etc at which to compare the results between untreated acid test ie; normal concrete and replacement of natural zeolite. Then the results must be indicated the test is suited or not.

Yubin Jun et.al.(2017) In the contemporary world, the cement and concrete industry is facing ecological challenges. Calcinations method for cement clinkers releases the tons of carbon dioxide interested in the setting which is the mainly efficiently global warming agent. The manufacturer OPC concrete also consumes a large quantity of freshwater, which is the rarest compound in the near potential in a number of parts of the world similar to the Middle East and northern parts of Africa. Pozzolans like fly ash, silica fume as well as some other equipment will cut the co_2 production. This usage alsoenhances the strength and durability of the concrete.

4. METHODOLOGY

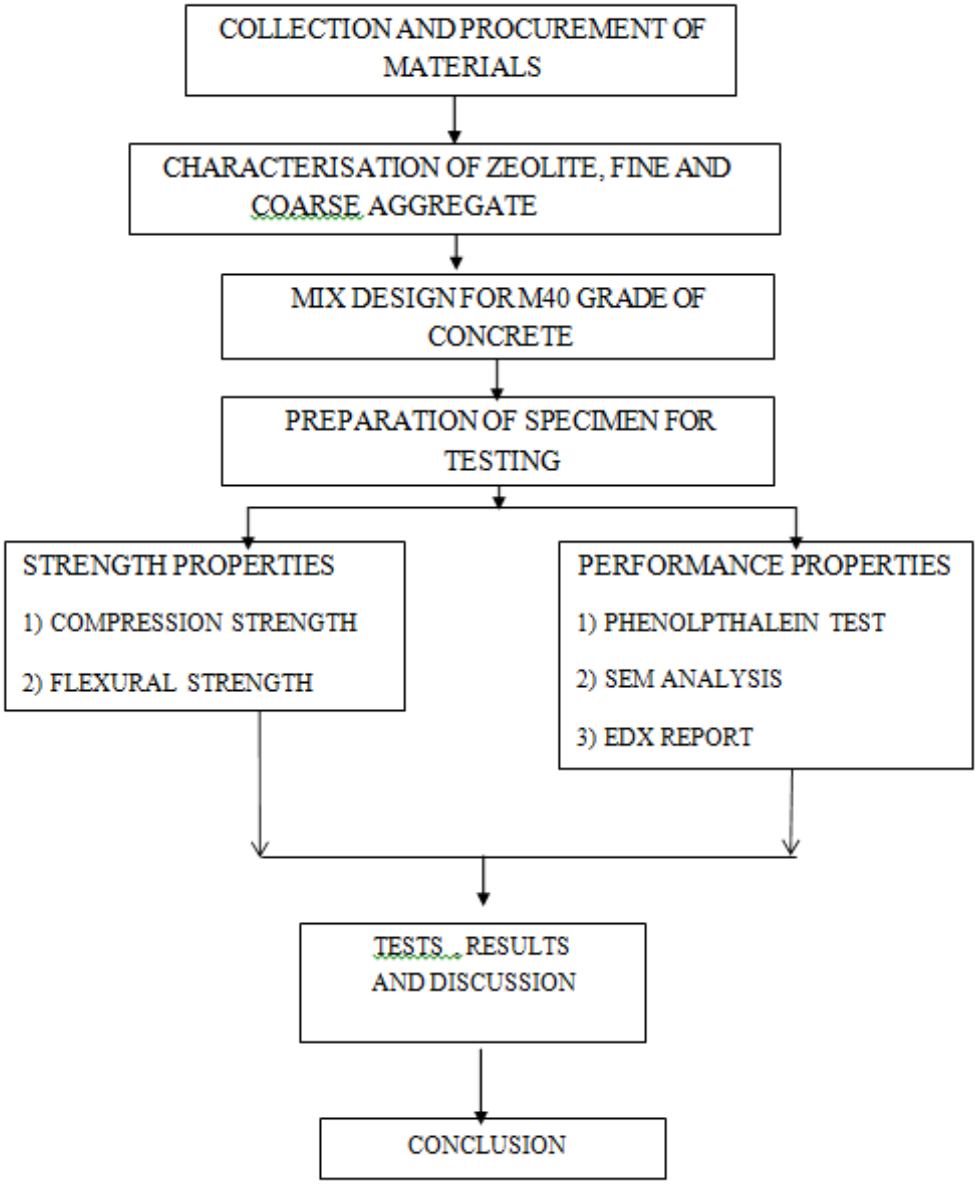


Fig: 1 Flowchart

5. TESTS, RESULTS AND DISCUSSION

1. Mix proportion

Table 1. Mix Proportion for M40

OPC 53 grade	Fine Aggregate	Coarse Aggregate	W/C Ratio
1	1.82	2.9	0.38

2. Compressive strength

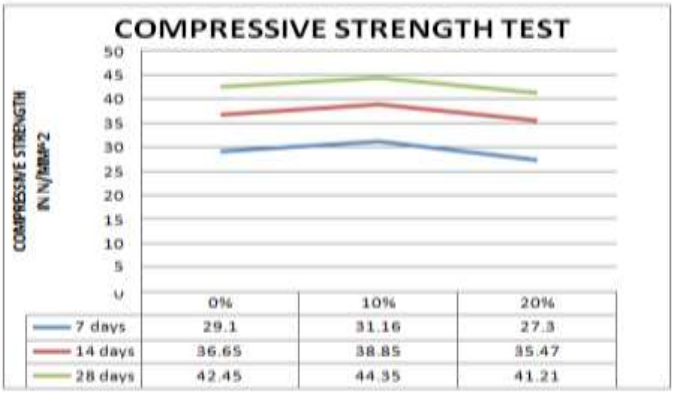


Fig: 2 Compression strength graph

The highest value of compressive strength was obtained at 10% replacement of cementwith zeolite powder.

3. Flexural strength

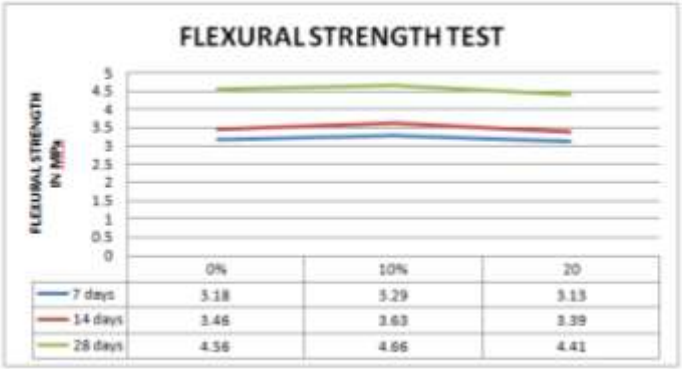


Fig: 3 Flexural strength graph

The highest value of flexural strength was obtained 4.56 MPa at 10% replacement ofcement with zeolite powder.

4. Phenolphthalein test

Fig 4 Phenolphthalein test

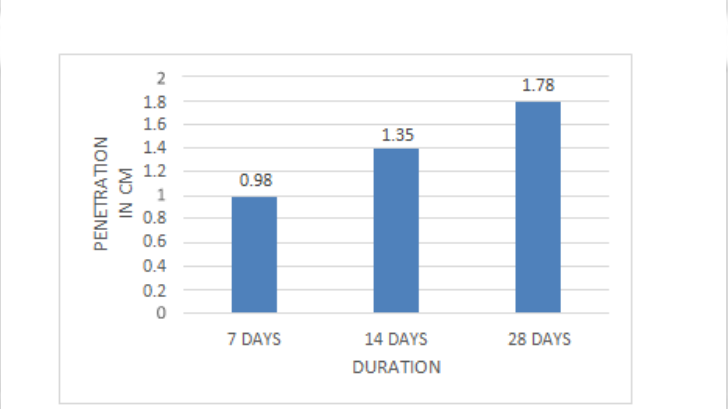


Fig 5 Phenolphthalein test graph

The adsorption of phenolphthalein indicates no carbon dioxide adsorption and the region without phenolphthalein indicates the carbon dioxide absorption. With respect to the above test the adopted 20% of zeolite have showed the adsorption property.

5. SEM analysis

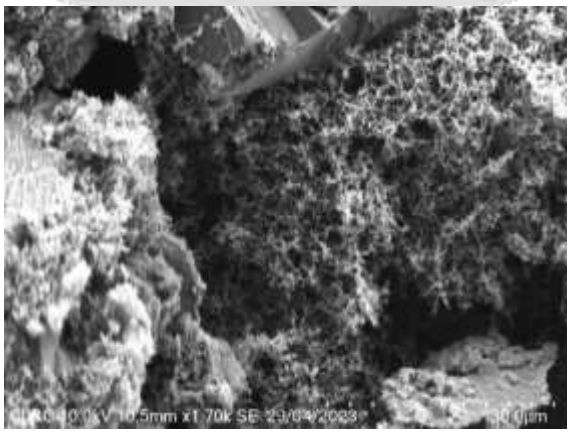
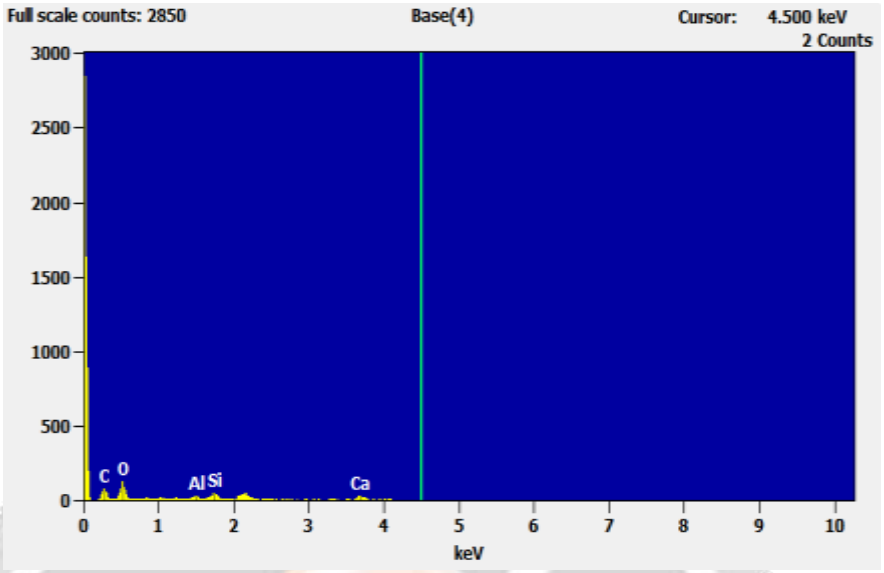


Fig 4.11 Molecular Structure of Zeolite, cementconcrete & aggregate

SEM analysis pictures shows the presence of zeolite and interfacial bond between the other materials. The honeycomb structure in these pictures shows that the concrete has adsorbed the corbon dioxide.

6. EDX report



Element Line	*Weight %*	*Weight % Error*	*Atom %*	*Atom % Error*
C K	2.33	± 0.20	9.15	± 0.53
O K	20.13	± 0.76	39.91	± 1.51
Al K	2.47	± 0.31	2.90	± 0.36
Si K	21.83	± 0.78	24.66	± 0.89
Si L	---	---	---	---
Ca K	18.23	± 1.11	14.43	± 0.88
Ca L	---	---	---	---
Nb L	35.01	± 2.58	11.95	± 0.88
Nb M	---	---	---	---
Total	100.00		100.00	

EDX results shows that the carbon element present in concrete block. Considerable amount carbon dioxide is adsorbed, Element weight of 2.33% with element error of ±0.2%.

6. CONCLUSION

It is estimated that there will be increase in the cement consumption by 23% in coming 30 years. Hence, it is required to look for ways to decrease carbon emissions from cement. In this regard, replacement of cement and its coarse aggregates in concrete by natural zeolites is one of the effective ways which is proven. The behavior of zeolite powder is different from cement. It helps for consuming the amount of CO2 which is used as fine aggregate in mortar. Silica fumes increases the strength, durability and performance of concrete.

- The behavior of zeolite powder is different from cement. It helps for consuming the amount of CO2 which is used as fine aggregate in mortar.
- Silica fumes increases the strength, durability and performance of concrete.
- The highest value of compressive strength and flexural strength was obtained at 10% replacement of cement with

zeolite powder.

- Phenolphthalein test conclude that the carbon is adsorb into to the concrete blocks. 10% replacement of cement with zeolite powder shows highest result.
- SEM analysis, microscopic view of honeycomb structure in concrete shows that the adsorb of carbon in concrete.
- EDX results conclude that the carbon element present in concrete block.

7. REFERENCES

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