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# Optimum Blending Percentage of Powdered Zeolite with Cement & Concrete Absorbing Carbon dioxide

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***Abstract: Concrete is the most used in day to day life in building and road material in world also nowadays pollution is also increasedinsurroundingsoourprojectworkistotrytosolvethisproblembypreparingconcretewhichabsorbingcarbondioxide zeolite is used to prepare this type of specimen.***
***Zeolite has properties to absorb natural gases and, in this project, we try to replace cement with zeolite with specific percentage of replacement.***
***Keywords: Concrete,Zeolite,Carbondioxideabsorption,Cementreplacement,Pollution reduction***

## I. INTRODUCTION

With the increase in population, the demand for the construction increases. There by the production. Of cement-based construction materials increase which emit more carbon dioxide int the atmosphere. Also, with the increase in pollution the demand for the own vehicle increase. This leads to more vehicle emissions of carbon dioxide and other toxic gases into the atmosphere and pollute the atmosphere. To make road construction more eco-friendly, we need to reduce the amount of carbon dioxide(CO2)emissions. Onewaytodothisisbyimprovinghowconcreteabsorbs$CO_2$.Zeolitepowder,aspecialmaterialwith lotsoftinyholesandsurfacearea,canhelpwiththis.Byusingzeoliteinconcretereplacementofcementtocapturemoreamount of $CO_2$. This research looks at how well this works and how easy it is to use zeolite in concrete.

## II. OBJECTIVE

*1)* Tostudyoutphysicalandchemicalpropertiestestingofpowderedzeoliteandopccement.
*2)* Tofindtheoptimumblendingpercentageofapowderedzeolitewithcementgetmaximumstrength
*3)* TostudyoutEconomyComparisonBetweenConventionalconcreteandzeoliteaddedconcrete.

## III. STUDY WORK

### A. *Properties Of Zeolite*

1:-EnvironmentalApplications

*1)* Co2 Absorption: - Due to its porous nature, zeolite can capture and store carbon reducing greenhouse gas emissions in concrete and other building.
*2)* WaterFiltration:-The high cation exchange capacity of zeolite allows itto remove heavy metals and ammonia fromwater, enhancing its effectiveness in environmental remediation efforts. 2:- Stability and Durability
*3)* ChemicalStability:-Zeoliteareknownfortheirhighphysicalandchemicalstability,attributedtostrongcovalentbonding within their framework. This stability allows Them to maintain structural integrity under various conditions.
*4)* Hydrophobicity:-High-Silicazeolitetendtobemorehydrophobic,makingthemsuitableforapplicationthatrequirethe absorption of bulky hydrophobic molecules such as hydrocarbons.

### B. *Properties Of Zeolite Mixing With A Concrete*

EnhancedDurability:-Zeoliteimprovesthelong-termdurabilityofconcretebyreducingitspermeability.Thismakes concrete lessproneto water infiltration, which can lead to issueslike corrosionof reinforcementsteel and freeze-thaw damage. By enhancingtheconcreteresistancetowaterandchemicalpenetration,zeolitehelpsextendthelifespanofstructures

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## IV. PREPRETION OF CONCRETE BLOCK

### A. *Procedure of Preparing block*

1) Clean the molds: Ensure that the molds are free from any debris, dust, or remnants of previous casts. That prevents contamination and ensures a smooth finish on the blocks
2) ApplyReleaseAgent:Tofacilitateeasyremovaloftheconcreteblocksapplyamouldreleaseagentsuchas oil
3) Filling the molds: Pour Concrete into molds: carefully pour the mixed concrete into the mould ensuring that it fills all corners and edges. Use a trowel to pack the concrete down.
4) Compactingtheconcrete:CompactforDensity:-useamanualtappingtocompacttheconcretewithinthemoulds.This step helps remove air bubbles and ensures uniform density throughout the block. The concrete moulds for at least 24 hours at room temperature. To set the concrete to remove the moisture content Curing Process
5) Allow Curing: - Once filled and levelled, Allow the concrete Block to cure in water for at least 7&14 Days curing is essential for achieving strength and durability.

### B. *MixproportionfromM30Grandeconcrete*

TABLE I
MIXPROPORTIONFROMM30GRANDECONCRETE

| Ingredients | Cement | FineAggregate | Coarse Aggregate | Water |
|---|---|---|---|---|
| Weightperm3 | 443kg | 727kg | 1097kg | 186lit |
| Ratio | 1 Kg | 1.64Kg | 2.47Kg | 0.42liter |
| 1Bag cement | 50 Kg | 82 Kg | 123.5Kg | 21 liter |

### C. *20%and30%replacementofcementwithzeolitematerialrequired.*

.TABLEII
20%REPLACEMENTMATERIAL

| Ingredients | Cement | Fine Aggregate | Coarse Aggregate | Zeolite powder | Water |
|---|---|---|---|---|---|
| Ratio | 1Kg | 1.64Kg | 2.47Kg | - | 0.42liter |
| 1 Cube | 1.870Kg | 3.200Kg | 5.100Kg | 0.470Kg | 1.5liter |

TABLEIII
30%REPLACEMENTMATERIAL

| Ingredients | Cement | Fine Aggregate | Coarse Aggregate | Zeolite powder | Water |
|---|---|---|---|---|---|
| Ratio | 1 Kg | 1.64Kg | 2.47Kg | - | 0.42liter |
| 1Cube | 1.630Kg | 3.200Kg | 5.100Kg | 0.700Kg | 1.5liter |

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## V. TESTING

### A. *Compressive testing*

TABLEIV
for7dayscuringof20%replacement

| Sr. No | Sample No | Dimensionsofthe cube [mm] | | | c/sareaof the cube[A]In mm2 | Failure Load [p]in kg | Failure Load[p1] in [N][1kg =9.81N] | Compressive Strength (δ)=P1/A in N/mm2 | Average % |
|---|---|---|---|---|---|---|---|---|---|
| | | L | W | H | | | | | |
| 1 | 1 | 150 | 150 | 150 | 22500 | 50000 | 490500 | 21.800 | 21.364 |
| 2 | 2 | 150 | 150 | 150 | 22500 | 48000 | 470880 | 20.928 | |
| 3 | 3 | 150 | 150 | 150 | 22500 | 49000 | 480690 | 21.364 | |

### B. *Carbonation Test.*

.TABLEV
Resourcesrequired

| Sr.No | Particulars | Specification | Quantity |
|---|---|---|---|
| 1 | Phenolphthaleinsolution | 0.2% Concentration | 300mlapprox. |
| 2 | Measuringscale. | ---- | 1no |
| 3 | Physician'sinjectionsyringeorneedle | 5cc | 1no |
| 4 | Concretecubesample | ---- | Asperavailability |

.TABLEVI
Carbonationtestresults.20%replacementcement

| Sr. No | Sample No. | Dimensionsofconcrete cube in [mm] | | | Area of concrete cube in [mm2] | Total area of concrete cube outofwhichthe carbonation is Done. | Carbonation is a done in percentage | Average % |
|---|---|---|---|---|---|---|---|---|
| | | L | W | H | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 150 | 150 | 150 | 22500 | 2900 | 12.89% | 12.053 |
| 2 | 2 | 150 | 150 | 150 | 22500 | 2336 | 10.38% | |
| 3 | 3 | 150 | 150 | 150 | 22500 | 2900 | 12.89% | |

*C. Figures*



Fig.1:Carbonationtestmeasureinmm.

## VI. COMPARISON

A.Compressive strength test comparison with M30 grade conventional concrete and 20% and 30% replacement cement withzeolite concrete.

.TABLEVII
Comparisonresults.

| Curingdays | Kept in environmentdays | Percentage replacementof cement | Conventionalconcrete strength in N/mm2 | Addedzeoliteconcrete in N/mm2 |
|---|---|---|---|---|
| 7 Days | 14 Days | 20% | 20.190 | 21.364 |
| 7 Days | 14 Days | 30% | 19.900 | 20.855 |
| 14 Days | 28 Days | 20% | 25.500 | 27.148 |
| 14 Days | 28 Days | 30% | 26.200 | 26.486 |

## VII.CONCLUSIONS

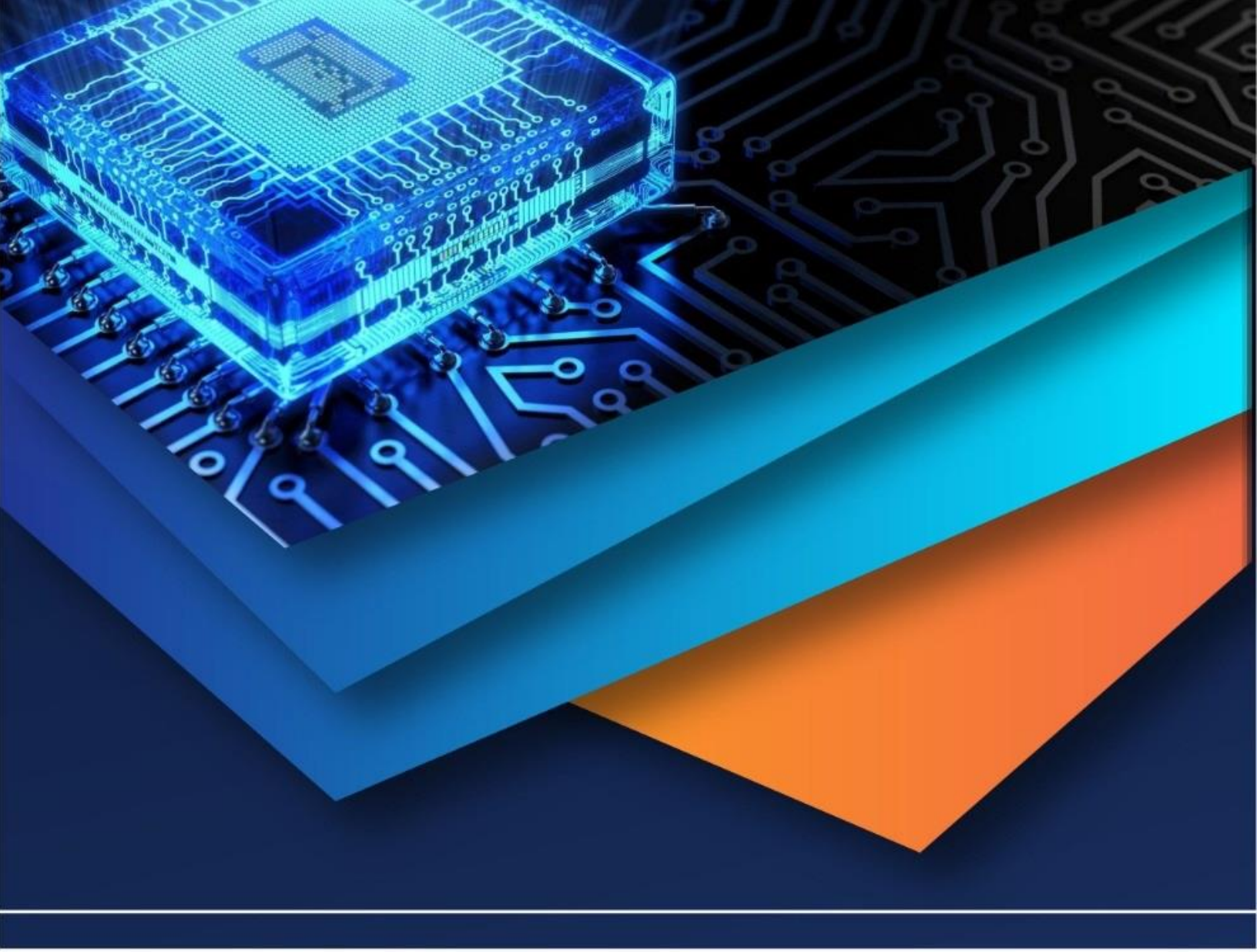
Concreteabsorbscarbondioxide(CO2)throughanaturalprocesscalledascarbonation.
Thisprocesscanoccurthroughoutthelifeofconcretestructure.zeoliteaddedconcretehasmorestrengththanconventionalconcrete. When we add 20% zeolite, we come to know that strength is more as compare to 30% of replacement ofzeolite. Zeolite added concrete absorbs more CO2 as compare to conventional concrete. Cost of zeolite added concrete is 10% more than conventional concrete)".

## VIII. ACKNOWLEDGMENT

Wetakethisopportunitytothankallwhohavecontributedinsuccessfulcompletionofthismajorprojectwork.Isincerelywish to express my gratitude to my major project guide Mr. V.T Hulwane, Mr. KP Mali sir for full support, expert guidance, encouragement and kind cooperation throughout themajorproject work.I am greatly indebted to her guiding us throughout the major project.

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