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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. OnewaytodothisisbyimprovinghowconcreteabsorbsCO_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

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

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)".

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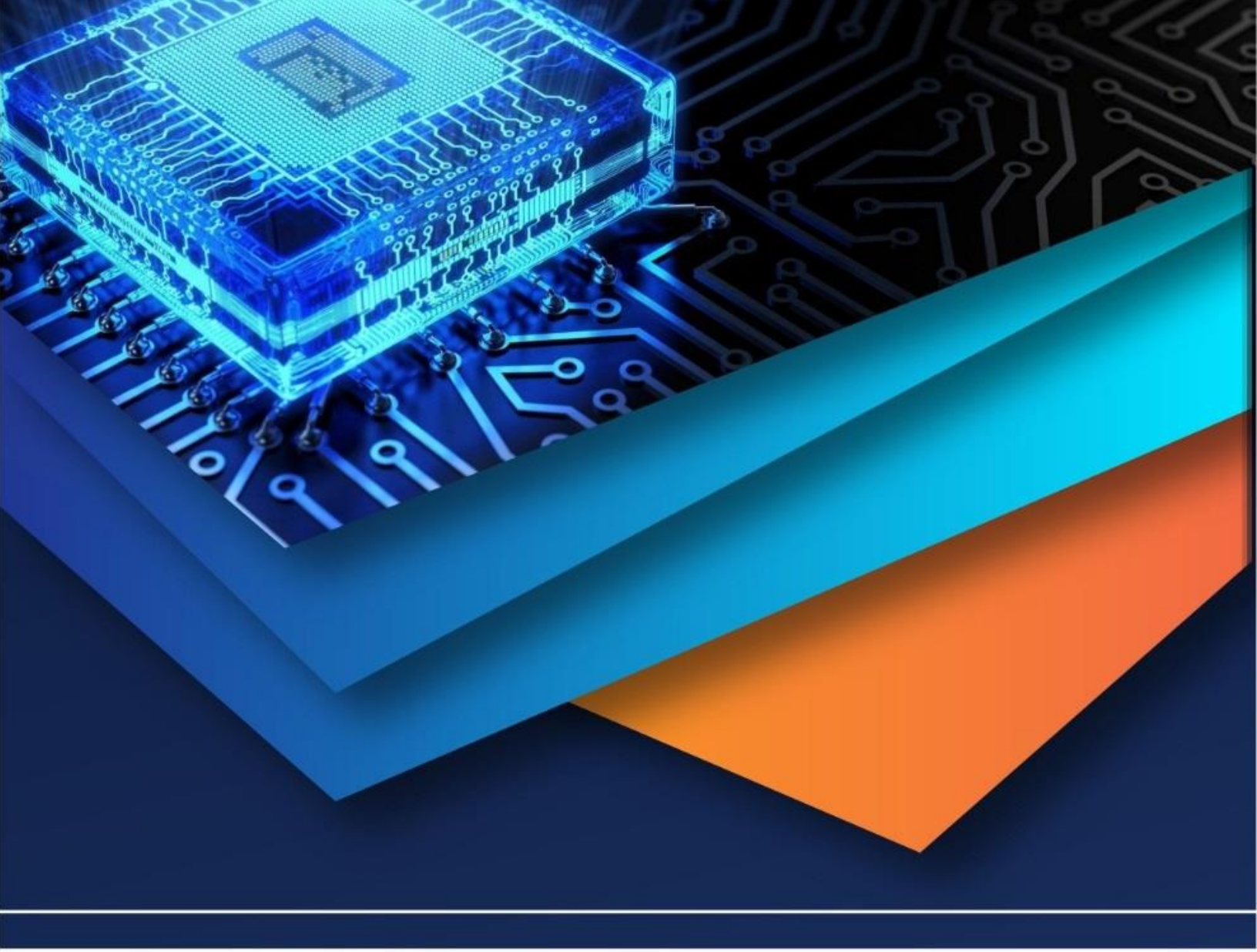

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