An experimental Investigation of concrete with partially replacement of Ceramic waste

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ABSTRACTIn the world construction, one material is used above all is concrete.Concrete is far more produced all over the world than any other man made material. It is incredibly versa-tile, and is used in almost all major construction projects. The amount and type of waste materials increasing because of in- crease in population.Many of the non-decaying materials remain present in environment for hundreds and thousands of years. This waste materials cause disposal crises and thereby contributing to the environmental problems.So the use of waste in concrete has been done for safe and economical disposal of waste materials. The use of waste materials not only saves natural resources and dumping spaces but also environment.Partial replacement of waste materialin concrete is done to achieve the desire properties of concrete such as strength, durability and workability. This paper gives idea about various waste materials used in concrete and their effects on various properties of concrete.

Keywords: Concrete,Ceramic Waste materials Partial replacement

II. LITERATURE REVIEW

Dr.HaiderK.Ammash,et.al.[2]studiedon the possibilities Waste Glass of size up to 5mm as a fine aggregate in concrete. The waste glass was used as a partial weight re- They found that, ceramic aggregate can be satisfactorily substituted for natural fine aggregate at replacement levels up to 20%. M. Iqbal Malik, et.al. [3] studied the use of Waste Glass as partial replacement of fine aggregates in concrete. Fine aggregates were replaced by ceramicas 20% weight for M-25 mix. The concrete specimens were tested for compressive strength, splitting tensile strength, durability and density at 28 days of age and the results obtained were compared with those of normal concrete. With increase in ceramic percentage water absorption decreases. Splitting tensile strength decreases with increase in ceramic content.

INTRODUCTION

At present no construction activity is possible without using concrete. It is the most common material used in construction worldwide. The main reason behind this is because of its high strength, durability and workability.

1.1 Binding Materials Cement or limes are used as the binding material. They behind the individual units of fine aggregate and coarse aggregate by virtue of its properties of setting or hardening in combination with water. The binding material helps to fill voids and imparts density to concrete.

1.2 Fine Aggregate

Fine aggregates generally consist of natural sand or crushed stone with most particles passing through a 3/8-inch sieve. Coarse aggregates are any

particles greater than 0.19 inch, but generally range between 3/8 and 1.5 inches in diameter.

1.3. Coarse Aggregate

It is the main filler and forms the bulk of concrete, broken stones, broken bricks and gravels are generally used as coarse aggregates. Granite, basalt are also excellent coarse aggregate. Crushing strength sand water tightness of concrete and its resistance to wear and tear depend upon the aggregates. The aggregate should be clean dense, hard, stronh,durable and sound

Ceramics waste

A ceramic is a solid material comprising inorganic compound of metal, nonmetal or metalloid atoms primarily held in ionic and covalent bonds

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1.4. Water

Water facilitates the spreading of cement over the aggregate and regulates the consistency. Water used should be clean. Sea water should not be used as it retards setting.

1.5. Properties of Materials

1.5.1. Cement

- Initial testing time should be less than 30 minutes.
- Final setting time should not more than 10Hrs.
- Compression strength after 7 days should not less than 22N/mm^2.
- Tensile strength after 7 days should be 2.5 N/mm^2.
- Ratio of percentage alumina to that iron oxide should not be less than 0.65%.
- Weight of magnesia should not exceed 5%.
- Weight of insoluble residue should not be greater than 1.50%.

1.5.2 Fine Aggregate

- It should be clean and coarse.
- It should be free from any organic or vegetable matter; usually 3-4% clay is permitted.
- It should be chemically inert
- It should contain sharp, angular, coarse and durable grains.
- It should not contain salts which attracts moisture from the atmosphere.
- It should be well grade; it should contain particles of various sizes in suitable proportions.
- It should be strong and durable.

1.5.3 Coarse Aggregate

- It should be contain sharp, angular, coarse and durable grains.
- It should be clean and free from coatings of clay and slit.
- It should be strong and durable.
- It should be free from any organic or vegetables matter; usually 3-4% clay is permitted.
- It should be clean and coarse.

1.5.4 Ceramic

- High strength
- High fracture toughness

- High hardness
- Excellent wear resistance
- Good frictional behaviors
- Anti-static

Material Testing and Results

Cement:Ordinary Portland cement of 43 grades is taken for the test and the results are follows;

S.No	Brand Name	Test	Results
1	OPC	Fineness	4%
2	OPC	Initial Setting Time	30 min
3	OPC	Final Setting Time	480min/8Hrs
4	OPC	Normal Consistency	32%

Table 1: Cement Tests and Results

Sand, Coarse Aggregate and ceramic waste

Pycnometer apparatus is used to measure specific gravity and bulk density, fineness modulus of aggregate is found by using set of sieves.

S.NO	Properties	Specific Gravity
1	Cement	3.15
2	Fine Aggregate	*2.65*
3	Coarse Aggregate	*2.75*
4	Ceramic waste	*1.6*

Table 2: Test Results of Sand, Coarse and Fine aggregate

Test Setup and Procedure for Compressive Strength

- Testing is done after 7 days 28 days, the days taken into account is from the time of water added to the ingredients.
- Test a minimum of 3 specimens at a time.
- Test the specimen immediately after talking it from the water and while they are in wet condition, wipe of the surface water. If the specimen received and dry, then keep them in water for 24hours before testing.
- Note down the dimension nearest to 02.mm and also note down height 1.

Fig.3.Compressive Strength test on Cube

Results and Discussion

The compressive strength of concrete using PVC was found and the results are discussed.

Ceramic %	Compressive Strength MPa(N/mm²)		
	7 days	14 days	28 days
0	23.23	29.65	32.04
20	26.13	30.81	33.19

Fig .4.Comparison of Compressive Strength of 7,14 & 28 Days Curing

Ceramic %	Split tensile test MPa (N/mm²)		
	7 days	14 days	28 days
0	1.98	2.86	3.50
20	2.23	3.56	3.92

Table 3: Results of Split Tensile Tests on Concrete

Conclusion

The effectiveness of internal curing by means of CERAMIC applied to concrete is higher when 45 kg/m^3 water is added by means of 1kg/m^3 of CERAMIC.. The self-cured concrete using CERAMIC was more economical than conventional cured concrete. The performance of the self-curing agent is mainly affected by the cement content and w/c ratioConcrete is casted for 7 days, 14 days and 28 days with CERAMIC of 20% was casted with M30 grade, which gives a slump value of 100mm which produce greater workability in a gradually increase of with CERAMIC of 20%.The optimum value of compressive strength of Self curing concrete with CERAMIC of 20% for 7 days,14 days and 28 days for curing period.

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