AN EXPERIMENTAL STUDY ON BEHAVIOUR OF CEMENT CONCRETE BY PARTIALLY REPLACING FINE AGGREGATE BY COPPER SLAG

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Abstract - *Copper slag is the waste material of the matte purifying and refining of copper with the end goal that every huge load of copper produces roughly 2.5 huge loads of copper slag. Copper slag is one of the materials that is considered as a waste which could have a promising future in development industry as an incomplete or full substitute of totals. For this task work M25 grade concrete was utilized and tests were directed for different extents of copper slag supplanting with sand of 0%, 10%, 20%, 30%, 40%, 50% and 60% in cement. The acquired outcomes were contrasted in traditional cement.*

***Key Words*: copper slag, copper, sand, M25 grade concrete, supplanting.**

1. INTRODUCTION

It is commonly realized that, the major prerequisite for making solid structures is to create acceptable quality cement. Great quality cement is created via cautiously blending concrete, water, and fine and coarse totals and consolidating admixtures varying to acquire the ideal item in quality and economy for any utilization.

Great solid, regardless of whether plain, fortified or pre-focused should be sufficiently able to convey superimposed burdens during its foreseen life. Other basic properties incorporate impermeability, strength, least measure of shrinkage and breaking.

1.1 Literature Review

- "USE OF COPPER SLAG AS A REPLACEMENT FOR FINE AGGREGATE IN REINFORCED CONCRETE SLENDER COLUMNS" by A S Alnuaimi
- "PERFORMANCE OF COPPER SLAG ON STRENGTH PROPERTIES AS PARTIAL REPLACE OF FINE AGGREGATES IN CONCRETE MIX DESIGN" by R R Chavan
- "UTILIZATION OF COPPER SLAG AS A PARTIAL REPLACEMENT OF FINE AGGREGATES IN CONCRETE" by Suresh Reddy S et.al
- "EFFECTS OF COPPER SLAG AS SAND REPLACEMENT IN CONCRETE" by M V Patil et.al
- "PROPERTIES OF CONCRETE FINE AGGREGATE PARTIALLY AND FULLY REPLACED WITH COPPER SLAG" by E Gopi Krishna et.al
- "UTILIZATION OF COPPER SLAG AS A PARTIAL REPLACEMENT OF FINE AGGREGATE IN CONCRETE" by Deepika K P et.al
- "A CASE STUDY ON COPPER SLAG AS PARTIAL REPLACEMENT OF FINE AGGREGATE" by N Sreenivasulu et.al
- "A STUDY OF CONCRETE USING COPPER SLAG AS A PARTIAL REPLACEMENT OF FINE AGGREGATE" by B Janakiramaiah et.al

1.2 Materials and Methodology.

- Materials:

It is well known that strength of concrete is dependent on the properties of its ingredients. The materials used in present investigation are as follows.

1. Ordinary Portland Cement(OPC)-53 grade.
2. M-Sand.
3. Copper Slag.
4. Coarse Aggregate.
5. Water.

- Methodology :

The present investigation is carried out to study the behaviour of partial replacement of M Sand with Copper Slag as an alternative material.

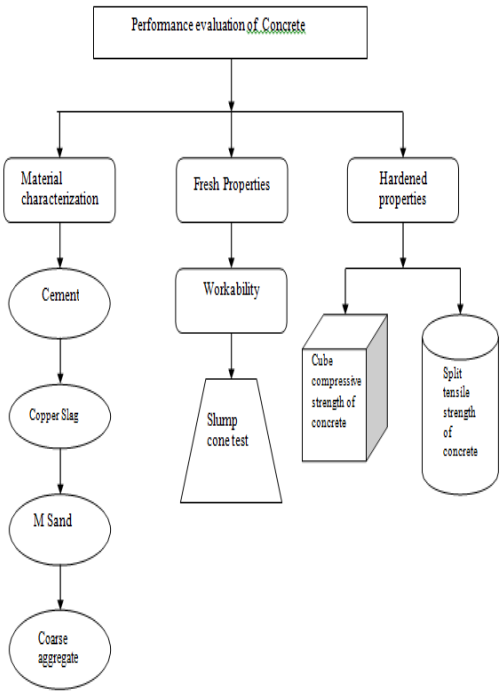

Chart -1: Flow chart of Methodology.

- Mix Design:

The process of selecting suitable ingredients of concrete and determining their relative amounts with the objective of producing a concrete of required strength, durability and workability as economically as possible is termed as concrete mix proportioning.

The mix proportion are designed as per IS 10262 2009 for M25 grade of concrete and chosen water cement ratio is 0.45 ,exposed to mild environmental condition. The mix proportion was done for replacement of fine aggregate with copper slag at various percentage i.e., 0%, 10%, 20%, 30%, 40%, 50%, and 60% respectively.

- Casting And Curing Of Specimen:

All the materials required are weigh batched according to mix proportion. Hand mixer is used for the mixing of concrete. The prepared mix is then cast into different specimens (cubes and cylinders) of standard size. After casting, all the test specimens were kept at room temperature for 24 hours and then de-moulded. These were then placed in water curing tank.

Water curing is done by immersing the specimen in tank available in the laboratory for the curing period of 7 days and 28 days.

Fig -1: Curing Of Specimen

2. RESULTS

The casted specimen were subjected to "compression Test" and "Split Tensile Strength Test".

The outcomes from these two test were as below.

Table -1: Compression strength of cubes for 28 days.

Replacement of copperslag in %.	Avg Load in KN.	Compressive strength in N/mm²
0	640	28.44
10	726	32.26
20	900	40
30	997.5	44.33
40	1017.66	45.22
50	988	43.91
60	920.65	40.91

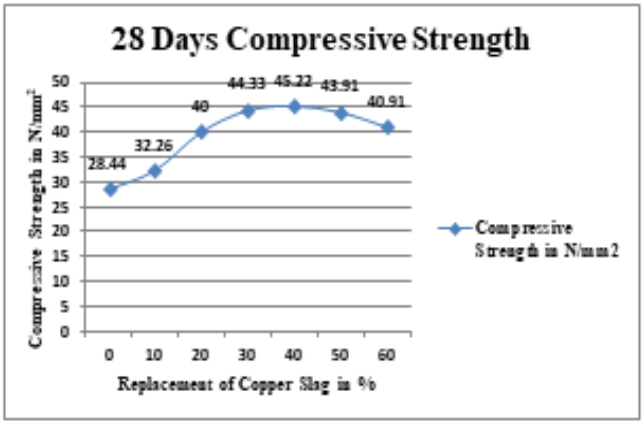

Chart -2: Variation of Compressive Strength after 28 days of Curing.

Table -1: Tensile strength of cylinders for 28 days.

Replacement of copperslag in %.	Avg Load in KN.	Tensile strength in N/mm²
0	183	2.58
10	212.66	3.00
20	240.66	3.40
30	253.5	3.58
40	215.13	3.04
50	206.23	2.91
60	199.13	2.81

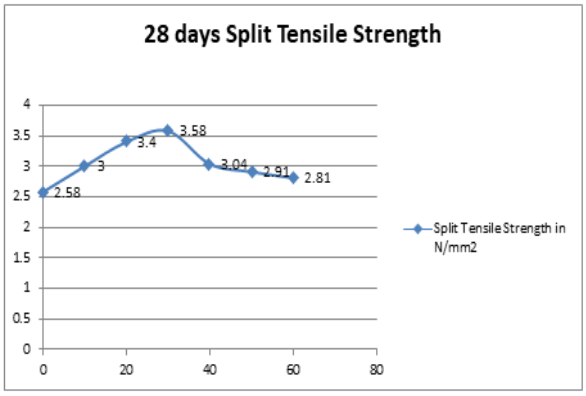

Chart -3: Variation of Tensile Strength after 28 days of Curing.

3. CONCLUSIONS

- At 10% Replacement of M-Sand by copper slag there is 13.43% increase in compressive strength with respect to conventional concrete.
- At 20% Replacement of M-Sand by copper slag there is 40.64% increase in compressive strength with respect to conventional concrete.
- At 30% Replacement of M-Sand by copper slag there is 55.87% increase in compressive strength with respect to conventional concrete.
- At 40% Replacement of M-Sand by copper slag there is 59.00% increase in compressive strength with respect to conventional concrete.
- At 10% Replacement of M-Sand by copper slag there is 16.27% increase in split tensile strength with respect to conventional concrete.
- At 20% Replacement of M-Sand by copper slag there is 31.78% increase in split tensile strength with respect to conventional concrete.
- At 30% Replacement of M-Sand by copper slag there is 38.75% increase in split tensile strength with respect to conventional concrete.

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