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Experimental study on strength properties of copper slag in concrete

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ABSTRACT

This project deals with the study on strength properties of concrete by adding copper slag as a partial replacement material for fine aggregate. Now a days, usage of natural sand lead to shortage of materials in construction. To overcome this copper slag a waste material can be used as partial replacement material. In this paper, copper slag is added from 0% to 50% of fine aggregate. Cubes were casted for M25 grade concrete for compressive strength, cylinder for split tensile strength and prism for flexural strength.

Keywords: Copper slag, Compressive strength, Partial replacement

INTRODUCTION

In construction industry, aggregates are the important materials but shortage of materials is increasing. So, alternative material to be used to replace the naturally available materials. Copper slag is a by-product obtained from copper refining and smelting matte. This reduces environmental pollution and wastage disposal [1].

MATERIALS USED

Table 1: Materials used

Material	Specific Gravity
Cement	3.15
Fine Aggregate	2.61
Coarse Aggregate	2.67
Copper Slag	3.1

SCOPE OF THE PROJECT

- Reduces wastage disposal
- Reduces usage of naturally available fineaggregate
- Costeffective
- Quality

EXPERIMENTAL INVESTIGATION

Mix proportion: M25 grade concrete is used for the investigation [2, 3].

Table 2: Mix proportion

Cement	Fine Aggregate	Coarse Aggregate	Water
438 Kg	446.76 Kg	876Kg	197 lit
1	1.02	2	0.45

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SPECIMENS FOR THE STUDY

Table 3: Details of specimen

Specimen	Size
Cube	150mm* 150mm
Cylinder	150mm*300mm
Prism	100mm*100mm*500mm

COMPRESSIVE STRENGTH

Six cubes were casted for every mix to get compressive strength of concrete in 7 and 28 days.

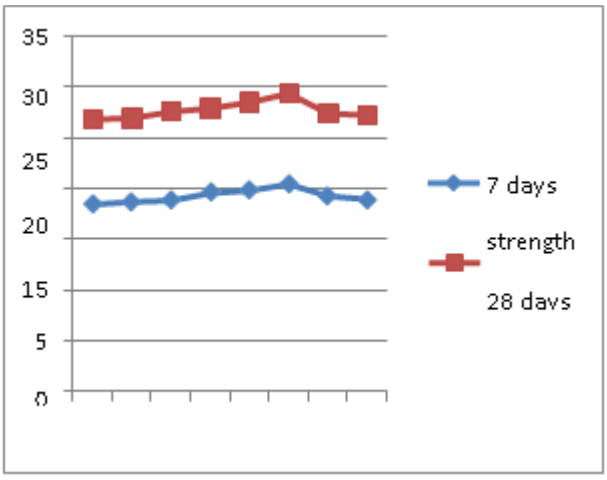
Table 4: Compressive Strength of M25 mix with copper slag

Mix	7 days strength	28 days strength
0%	18.43	26.78
20%	18.68	26.91
25%	18.81	27.53
30%	19.52	27.89
35%	19.79	28.45
40%	20.42	29.34
45%	19.25	27.36
50%	18.94	27.21

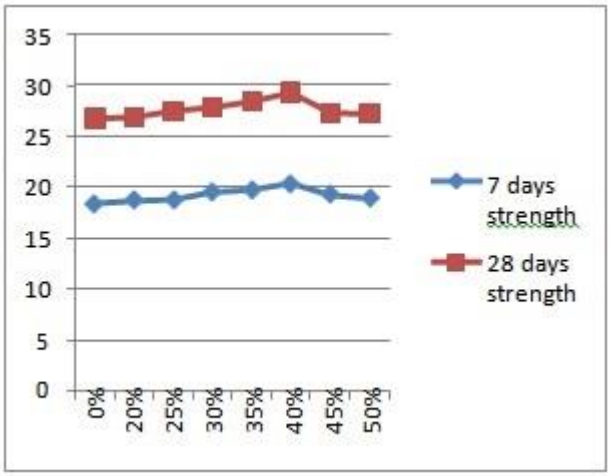
Three cylinders and three prism were casted for every mix to get split tensile strength and flexural strength of concrete in 28 days [4, 5].

Table 5: Split tensile and flexural Strength of M25 mix with copper slag

Mix	Split tensile Strength	flexural Strength
0%	2.42	8.23
20%	2.41	8.46
25%	2.39	8.45
30%	2.45	8.50
35%	2.49	8.64
40%	2.52	8.98
45%	2.46	8.49
50%	2.44	8.23



Graph 1: Compressive Strength of M25 mix with copper slag



Graph 2: Split tensile and flexural Strength of M25 mix with copper slag

SPLITTENSILE STRENGTH AND FLEXURAL STRENGTH CONCLUSIONS

1. Percentage increase of copper slag gives good compressive strength compared to conventional mix.
2. Copper slag 40% replaced to fine aggregate gives more strength.
3. It gives good split tensile and flexural strength.

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