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# Investigation on Properties of Hooked Steel Fiber Reinforced By Partial Replacement of Cement with GGBS

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**Abstract-** Today, we use chemicals that alter the physical properties of concrete to strengthen it. Tightly bound particles combine to form concrete, which enhances the qualities of rock as an industrial material.

This study has focused on the blended concrete's compressive strength and split tensile strength. The clay mineral kaolinite is transformed into a different form called metakaolin. In addition to being used frequently in the creation of ceramics, metakaolin can also be substituted for cement in concrete.Titanium dioxide is a cementation material that can partially substitute cement in concrete.Metakaolin is replaces wth cement by 15% maintaing constant and added titaniumdioxide with different percentages of 0.6%,0.8%,1% and 1.2% with cement.To determine the compressive and split tensile strength of concrete.

.**KEYWORDS:** Titaniumdioxide, Metakaolin, Compressive strength and Split tensile strength.

## 1. INTRODUCTION

Concrete is the most commonly used and extremely strong construction material. Concrete is a mixture of cement, coarse and fine particles, and water. Concrete is the connecting ingredient that holds the coarse and fine particles together. The concrete and water form a framework for a glue or gel that covers the sand and rock. Total coarse aggregates are used as quality material.To avoid these challenges, we now use diverse sources of admixtures in the solid. The expansion of steel strands in the solid and fractional supplementation of cement with metakaolin was investigated in this study.

## 2. OBJECTIVES

a. To Optimize the cement by adding Metakaolin and Titanumdioxide.

b. To determine the compressive and split tensile strength in concrete.

## 3. MATERIALS

**a. Cement:** Regular Portland cement with a grade of 53 was employed for this exploratory experiment. High strength cements must be utilized to create high performance concrete. Choosing the appropriate cement brand and kind is critical for generating high-quality concrete. The rate of hydration was determined by the type of cement used. It is also critical to ensure that the chemical and mineral admixtures are equal to cement.

**b. Fine Aggregate:** The most important component of concrete built from crushed stone or natural sand is fine aggregate. The density and quality of the fine aggregate have a significant impact on the hardened properties of the concrete.

**C.Coarse Aggregate:** Material that remains after an IS Sieve of 4.75 mm is known as coarse aggregate. The usual maximum size increases by 10 to 20 mm, according to IS 383:1970.

**d.Water:** It is one of the most important building resources because it is necessary for numerous procedures such as curing work, mixing cement, and making mortar. The strength of the motor and the cement concrete is directly affected by the quality of the water used in the construction project.

**e. Metakaolin:** Significant study has been conducted on activated ordinary clay and kaolinitic clay. These unpurified elements have been referred to as "metakaolin" by some. The term "high reactive metakaolin" refers to a product that is white or cream in color, purified, and thermally activated.

**f. Titanium dioxide:** It is a naturally occurring compound that consists of titanium and oxygen. It is an inorganic

substance. This material provides excellent flexural strength while also imparting a white hue to the concrete.

## 4. RESULTS AND DISCUSSIONS

**a. Compressive strength test:** The compression strength test is performed on a cube-shaped cast specimen of 150 mm by 150 mm by 150 mm. The cast specimen's strength was measured 7 and 28 days after it had finished curing in a water tank.

**Table 1: Compressive Strength Results on Concrete by Partial Replacement of 15% Of MK and % Of TIO2**

| S.No | 15% Of MK and % Of TIO2 | Compressive Strength Results, N/mm² | |
|---|---|---|---|
| | | 7 days | 28 days |
| 1 | 0% | 26.82 | 39.16 |
| 2 | 15%MK+0.6%TIO2 | 33.48 | 49.39 |
| 3 | 15%MK+0.8%TIO2 | 34.69 | 50.43 |
| 4 | 15%MK+1%TIO2 | 35.73 | 51.68 |
| 5 | 15%MK+1.2%TIO2 | 34.48 | 49.34 |

**b,Split tensile Strength test:** The cylindrical specimens (150mm diameter x 300mm height) were evaluated for split tensile strength at 7 and 28 days of age.

**Table 2: Split Tensile Strength Results on Concrete by Partial Replacement of 15% Of MK and % Of TIO2**

| S.No | % Of Graphene Oxide | Split tensile Strength Results, N/mm² | |
|---|---|---|---|
| | | 7 days | 28 days |
| 1 | 0% | 2.47 | 3.79 |
| 2 | 15%MK+0.6%TIO2 | 3.37 | 4.85 |
| 3 | 15%MK+0.8%TIO2 | 3.51 | 4.98 |
| 4 | 15%MK+1%TIO2 | 3.78 | 5.42 |
| 5 | 15%MK+1.2%TIO2 | 3.71 | 5.11 |

## 5. CONCLUSIONS

1. The Normal Concrete of Compressive Strength result for 7 and 28 days is 26.82 N/mm² and 39.16 N/mm².
2. The Normal Concrete of Split tensile Strength results are for 7 and 28 days is 2.47 N/mm² and 3.79 N/mm².
3. By 15%MK and 1% TIO2 the Compressive Strength results for 7 and 28 days is 35.73 N/mm² and 51.68 N/mm².
4. By 15%MK and 1% TIO2 the Split tensile Strength results for 7 and 28 days is 3.78 N/mm² and 5.42 N/mm².

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