

# A STUDY ON NYLON FIBRE REINFORCED CONCRETE BY PARTIAL REPLACEMENT OF CEMENT WITH METAKAOLIN : A LITERATURE REVIEW

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**Abstract** – In this literature review will be done on nylon fibre reinforced concrete by partial replacement of cement with metakaolin. The nylon fibre are very useful as it has variety of applications like its high strength, durability, tensile strength but its disposal pose a serious threat in environment. In present study, various proportions of nylon fibre are added in concrete and its effect on workability, compressive strength and tensile strength is reported. The paper states that nylon fibre material of diameter 0.35mm and length of 50mm with aspect ratio of 143 will be used in different percentage from 0.5 to 1.5% by weight in cement. After adding certain properties like compressive strength, split tensile strength, flexural strength will be studied.



Fig : Sample of Nylon Fibre

**Key Words:** Nylon Fibre, Metakaolin, Concrete, Strength

## 1. INTRODUCTION

Concrete is a brittle material whereas steel is a ductile material. Concrete is strong in compression and weak in tension but steel is strong in tension but weak in compression. Nylon fibre added in concrete improves the tensile strength but decreases the workability. For this Metakaolin will be added which improves the workability of concrete but has certain drawback as reduces the setting time of concrete. Metakaolin is refined kaolin clay that is fired under carefully controlled conditions to create an amorphous alumina silicate that is reactive in concrete. Addition of Metakaolin results in faster early age strength development of concrete. The best strength is generally obtained by adding 10% metakaolin by weight of cement.

## 2. MATERIALS

### A) NYLON FIBRE

Nylon fibre is rarely used in India

- i. Length of fiber – 50 mm
- ii. Diameter – 0.35 mm
- iii. Resistance to salt & acid - Good
- iv. Specific gravity - 1.13
- v. Resistance to alkali - Good
- vi. Water absorption - 3%
- vii. Color - White

### B) METAKAOLIN

Properties	Values
Appearance	Off- White Powder
pH (10% solids)	4.1 - 5.2
Bulk Density (Kg/l)	0.4 - 0.6
Specific Gravity	2.5
Loss on Ignition (%)	1.6



Fig : Sample of Metakaolin

## 3. LITERATURE REVIEW

- E. Siva Subramanian et al[1] has studied “Experimental Investigation Of Concrete Composite Using Nylon Fibre” and identified that Nylon Fibre Reinforced Concrete has far better strength than normal concrete. He took four mix designs of concrete including Nylon Fibre

Reinforced of 1%, 2%, 3% and Normal Concrete and also found that adding 1% Nylon of total volume of concrete achieves more strength than that of normal concrete.

- Anirudh Swami et al has studied "Use of Nylon Fibre in Concrete" and concluded that nylon fibre is non-environmental friendly so it must be properly disposed off. The fibres improves its strength, tensile strength, durability. If used in concrete, it decreases the nylon in disposing off making it environmental friendly concrete. The workability of concrete is reduced as nylon absorbs water thus reducing the slump value. It gives best strength when used with 1% of nylon fibre. The tensile strength also increases by 60-70% at high amount of nylon fibre which makes it useful in places where it is expected that slight tensile stresses may overcome like temperature stresses, creep etc.
- Jaya Saxena et al has studied "Enhancement the Strength of Conventional Concrete by using Nylon Fibre" and concluded that nylon fibre mixed with concrete gives better compressive strength. He also tested with 0.2%, 0.25%, 0.3% nylon fibre reinforced concrete and found the strength of concrete increased. He added 10%, 20%, 30% fly ash with concrete having different percentage of nylon fibre as mentioned above and found good strength of concrete.
- K.Manikandan et al has studied "Experimental Investigation On Nylon Fiber Reinforced Concrete" and found that 2% nylon fibre replaced with fine aggregate gives improved strength of concrete. The compressive strength is increased by 1.1%, split tensile strength is increased by 1.06% and flexural strength is increased by 1.29%. The specimen was also cast with 4% and 6% nylon fibre and the strength was improved.
- Saravanakumar Jagannathan et al studied "An Experimental Investigation on Nylon Fibre (Textile Waste) Reinforced Concrete" and concluded that addition of fibre 0.5%, 1.0% and 1.5% in concrete and found that the concrete containing 1.0% of fibre has the good strength as compared to others. He also got that there will be reduction in pollution caused due to nylon fibre as it is utilized in concrete.
- M. Nazeer et al has studied "Strength Studies on Metakaolin Blended High-Volume Fly Ash Concrete" and concluded that flyash and metakaolin mixed with concrete reduces the workability of concrete. Addition of metakaolin

reduces compressive strength, split tensile strength, flexural strength of concrete specimen.

- Kamaldeep Kaur et al studied "Determination of Optimum Percentage of Metakaolin by Compressive Strength and XRD Analysis and found that compressive strength is increased on addition of 0%, 7%, 8% but it gets decreased after further addition of metakaolin.
- Nova John studied "Strength Properties of Metakaolin Admixed Concrete" and observed that addition of metakaolin increases faster early age strength. 15% replacement of metakaolin with cement gives better strength of concrete.
- Rakesh Kumar studied "Effect of Metakaolin and Recycled Fine Aggregate on Workability and Compressive Strength of Concrete" and observed that metakaolin is used with 13% as a replacement of cement and after testing he found that there is 41% increase in strength at the age of 7 days.
- Vikas Srivastava et al has studied "Effect of Silica Fume and Metakaolin combination on concrete" and concluded that the slump is found to decrease with increase in Metakaolin content at all the Silica fume contents considerably. The optimum dose of Silica fume and Metakaolin in combination is found to be 6% and 15% (by weight) respectively at both 7 and 28 day compressive strength.

#### 4. CONCLUSIONS

- 1) On addition of Nylon Fibre in concrete we conclude that tensile strength gets increased.
- 2) Nylon Fibre is a waste material so it can be utilized in concrete for the replacement of fine aggregate.
- 3) The compressive strength, split tensile strength, flexural strength of concrete gets increased on addition of 1% nylon fibre.
- 4) Metakaolin mixed with concrete reduced the setting time of concrete.
- 5) 10% Metakaolin can be used as a replacement of cement.
- 6) The increase in percentage of metakaolin increases the compressive strength, split tensile strength, flexural strength.
- 7) There is no work done for both metakaolin and nylon fibre combined and mixed in concrete.

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