

A Brief Review on Experimental Study on Strengthening of Reinforced Concrete Beams Using Mineral Based Composites

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Abstract – In this project represents using mineral of the concrete is very important for the construction purpose. This type of concrete is giving the more strength and life for the structures. And, also using this minerals repairing and rehabilitation of the structures. Glass fiber reinforced polymer sheet using for binding materials. Using this materials to avoid the flexure deficient, shear deficient and also retrofitted preloaded reinforced concrete beams. For giving the bonding capacity used as epoxy and cementitious composite .generally epoxy have a well bonding capacity and also good strengthen the structures. These mixing properties are given better result.

Index Terms – GFRP Sheets, EPOXY Resin, METAKAOLIN, FRP, Shear Strengthening Flexure, RCC Beams.

1. INTRODUCTION

Fiber polymer composites materials having high strength and stiffness. Glass fibre reinforced polymer helps to avoid from damage surface during construction .this glass fibre reinforced polymer the stress are transfer from the fibre.it should be chemically compound of fibre.the important role of the glass fibre reinforced polymer is controlling the full of stress strain behavior to resist a corrosion and failure.

Epoxy resins are a thermoset materials extensively used in structural.it is available in a form of low viscosity liquid to high milding solids.it offer high strength and low shrinkage and low cost effective electrical insulation.this used for composite design in commercial and military aerospace.application of epoxy resins are to generate the specific physical and mechanical properties.

Met kaolin is a calcination of clay mineral.it is manufacturing is break down the crystal structures of high surface area.it is preparing by optimum burning temperature based using mineral .metakaolin is used in concrete replacement level of pc.and,also used modifies water transport.metakaolin properties of ,mechanical properties in compressive strength, and flexural strength .durability properties in sulphate resistance.

Fiber reinforced polymer is a composite material .it is made of a polymer matrix reinforced with fibers.the fibers are usually glass,carbon,aramind.other fibers are, paper or wood or asbestos have been used rarely. The fiber reinforced polymer application is, high strength and lighter weight. And also, longer lasting, high performance. Fiber reinforced polymer uses for highways and bridges, utility poles, pipelines, renewable energy harvesting, natural composites for green buildings, modular houses.

2. OBJECTIVE

The main target of this study is to strengthen the reinforced concrete beams .the properties are fiber reinforced polymer.metakaolin and epoxy resins and various properties using.

3. LITERATURE REVIEW

Badanoiu.A.(2001)This study of investigations are explained about the repair and strengthening of upgraded concrete structures.one of the method is CFRP(carbon fiber reinforced polymer)bonding.it has solved the most of the applications .the difficult of the this studying is using epoxy resins bonding agent. Due to working environment and temperature .to avoid this difficult to replace the epoxy adhesive. Mineral based bonding agent. For example polymer mortar .this polymer mortar is working environmental friendly .the combination of polymer mortar and fiber reinforced polymers can be used for repair and strengthening structures. This paper represents the RC beams strengthened in shear with mineral based bonding agent and CFRP. The strengthening effect is compared to 40% to 100% of strengthened beam.

Stephen Kurtz et.al. (2001) studied that inorganic matrix system provided have higher post yield stiffness. Failure deflection of the beam with the inorganic system was 25% less than that of the beam strengthened with the organic system and no delamination is noted.

Alee(2003):The fiber reinforced concrete is proposed by simple effective and practice constitutive model for cohesive fracture for two differentiating zone that is the aggregate bridging zone and fiber bridging zone. The total fracture energy is related to aggregate bridging zone. the fiber bridging zone is the total fracture energy is related the difference between fiber reinforced concrete and plane concrete .the cohesive fracture model conducted by which through three point binding and tensile tests. The fiber reinforced concrete beams and plain concrete is functionally layered in single beam spa cements. This model is valid for the fiber reinforced concrete (or) composites.

Santhakumar (2004) this paper represented about the behavior of reinforced concrete shear beams.it was carried out the RC beam designed by using the carbon fiber reinforced plastic. The effect of the untracked beams is also studied. The ANSYS lab used to fine the finite elements are also studied. The part of the beam was used for modeling to find out the advantage of beam and loadings. The deflection of the load plotted obtained from the numerical study. The crack pattern in the beam is also presented.

Thomas Blanksvard et al.,(2007)Studied the strengthening concrete structures with MBC system and it can be favourable in comparison to existing .the external strengthening such as epoxy bonded CFRP and it can be applied on moist surfaces and is open for diffusion .the strains stirrups for a certain load decrease with the use of Mineral Based Composites compared to the strains in a beam specimen without the MBC .the proposed analytical model to estimate the shear resistances gives reasonable correlation to experimental values.it suggested for optimal systems as mortar with higher fracture toughness together with the incorporation of more fibers.

Francisco(2009)The fiber reinforced polymer systems are included for the construction purpose to increase the strength and ductility .geopolymer added in the concrete is given result early to achieve the goal of the result and develop the strength and ductility cement based composite material system is added in the concrete.

M.C.Sundarraja (2009) et.al. The glass fiber reinforced inclined strips epoxy bonded to the beam shear strengthening of RC beams. This aimed to check effectiveness in terms of width and spacing of GFRP on Shear capacity of the RC beams. Two point loading method was adopted for the test number of failure mode have observed in the RC beams strengthened in shear by FRP.finally using GFRP more effective in the diagonal cracks .

Hwai -Chung et al., (2010) investigated the efficiency of retrofitting using both epoxy and cement based thin sheet. Compressive and flexural strength of concrete is greatly improved using external FRC wraps similar to that of FRP sheets. The ductility of the retrofitted concrete is significantly

increase .it is observed that bonding between concrete and FRC is excellent and no sign of delaminating is noted in case of CFRC beams.CFRP beam has a much higher flexural strength than the CFRC beam and ductility of both beams is same.

Yasmeen Taleb Obaidat et.al., (2011) Studied the flexural and shear behaviour of reinforced beams retrofitted with CFRP plates to the concrete surface and epoxy was used as binding agents.after testing the beams.the stiffness of the CFRP retrofitted beams is increased compared to that of control beams .employing externally bonded CFRP plates resulted in an increase in maximum load of the retrofitted specimens reached values about 23% retrofitting. CFRP plate's length has the range of flexural and shear results are between 7% to 33% .CFRP can make the more effective for a repair and strengthening of beam.

Daniel Bagging (2014): the shear performance of reinforced concrete beams strengthened with carbon fiber reinforced polymer.glass fiber reinforced polymers and fiber reinforced cementitious matrix sheets and fiber reinforced polymer anchors and one control specimen.the beam were simply supported with a clear span of 2200mm with 400mm spacing between the two loading points and shear span of 900mm.finally they found that beams strengthened with glass fiber reinforced polymers full depth and partial depth of 50% and 36% increase in the ultimate load and then control specimen.

4. ADVANTAGES

Light weight composite parts helps to save weight compared to steel parts up to 30 percent lighter in theromechanical properties high strength of glass fibers are stronger than steel. Composite can be molded in to complex shapes.at relatively low cost.

Composites provide long term corrosion resistance to severe chemical and temperature environments.

Low weight and high mechanical properties .use of composites in many applications reduces manufacture costs compared to traditional materials such as steel.

5. CONCLUSION

From this study the results are compared to 2.5 times increase the low carrying capacity when compared normal concrete. Mineral based composites strengthening increased the micro crack formation by 38%.strengthening with mineral based composite reduces strain for all load in comparison to a non-strengthened specimen. Researches have reported on different failure mode .the study of carbon fiber reinforced polymer stiffness and width is inclined in this workforce used to design more economical structural systems.FRC is one of the application of multifunctional and functionally graded concrete materials. Mineral based composites are more strengthened.

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