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A review on geopolymer using fly ash and GGBS

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ABSTRACT

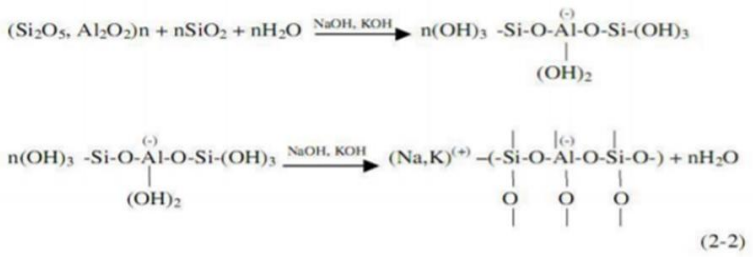
If we talk about today's era, Concrete is the most important aspect in the present scenario in terms of construction. All the construction is being done with the help of this building material. Use of cement is rising on the peak from the last few decades due to the enormous demand for construction of megastructures all around the globe. In addition to that cement is the only material whose demand is increasing day by day in order to meet the needs of mankind. Subsequently, the price of cement is also increasing as its demand is increasing profoundly and also it available limited only. Manufacturing of cement results in the emission of CO2 and other gases which contribute to global warming and which further contribute to climate change and thus it is one of the most complicated material. Its use cannot be stopped but can be limited by using various materials. In order to dilute the use of cement, various alternatives and substitutes have been manufactured which is contributing to less pollution as compared to cement. Since cement cannot be fully replaced, it has been partially replaced with geopolymer using fly ash and GGBS.

Keywords— *Fly ash, GGBS, Cement*

1. INTRODUCTION

Cement is one of the most important material that is being used since ages in the construction of buildings, dams, various kinds of structures etc all around the world. The term cement came after the 19th century. Before the 19th century, there were some other alternatives were used.

According to the survey, there is approximate 3,000,000,000 ton of cement is being used for the construction industry every year and the counting is still going on. Since the Limestone is the main source material for the ordinary Portland cement an acute shortage of limestone may come after 25 to 50 years. Moreover while producing one ton of cement, approximately one ton of carbon dioxide will be emitted to the atmosphere, which is a major threat for the environment. The other important parameter of the above quantity of energy is required in the production of cement and other materials. Hence it is most essential to find an alternative binder. The Cement production generated carbon dioxide, which pollutes the atmosphere. The Thermal Industry manufactures a waste called fly ash which is blindly disposed and dumped on the earth, rivers, canals, etc which occupies larges areas.



In today's era fly, ash has become a very important part of the construction industry which can revolutionize the construction industry. The properties of fly ash make it one of the most advanced materials that are being used nowadays. Fly ash is also called the pulverised fuel ash in some of the European and Asian countries because it is the by-product waste. The components of fly ash vary with different sources.

GGBS is also known in granulated blast furnace slag or slag cement in some countries. The GGBS is actually a by-product of iron and steel making from the various kinds of blast furnace

2. LITERATURE REVIEW

Lohani (2012): He conducted the experimental study using fly ash with 0.5% carbon content. He made the specimen of M20 and M25 grade concrete. As an environmental concerned researcher, he conducted a comparative study of ordinary Portland cement with geopolymer concrete. In his study, he made shocking revelations about the environmental concerns of various pollution-related parameters. In his study, he clearly figured out the way that industries are causing way too much of pollution which is not only causing damage but harming the environment in the most decent way. In his study only he concluded the fact that cement only is causing 9.78% of the world's pollution. He sated the fact that indeed the pollution content is very low but still can be very harmful in the upcoming future.

With his comparative study, he concluded the fact that geopolymer is of great fire resistance as compared to geopolymer concrete. Also, he stated the fact that geopolymer is far better than ordinary Portland cement in terms of compressive strength. The most important aspect that he figured out that the geopolymer are cost-efficient, i.e. the cost of building reduced if we use geopolymer concrete. It is not only cost effective but also durable as compared to the structures which are made up of OPC. He also claimed that Geopolymer concrete is corrosion free.

Raijiwala (2011): In his he discussed with the process of making geopolymers from thermal power plants using fly ash. He briefly discussed the various properties of geopolymers using fly ash and GGBS. He was into the fact that geopolymers are completely resistant from chemical attacks. Also in his studies, he concludes the fact the geopolymer concrete has higher compressive strength by the addition of fly ash. He concluded the fact by doing the experiment in which two specimens was taken and cured and heated at 25 and 60 degree Celsius in the oven. With these specimen, he studied the geopolymer's characteristics such as compressive strength, curing temperature, the effect of wet mixing time, the slump of concrete, the effect of superplasticizer, etc. He gave the conclusions that compressive strength is increased by 1.5 times and split tensile strength.

His paper completely dealt with the fact that geopolymer shows various kinds of properties which is the need of the hour to design more substitutional materials which can replace cement to some extent helping in the eco-friendly environment.

Ranganath (2008): He did a study on various factors ranging from water-cement ratio, fly ash, the ratio of sodium silicate to sodium hydroxide. In his study, he found that the compressive strength of geopolymer structure is directly proportional to the content of fly ash. The water content increase is also responsible to maintain the maximum strength of material made by geopolymer using flash and GGBS. Also, the addition of fly ash does not contribute to additional strength. According to the study longer the curing time, higher will be the strength of the material. Also, another fact came into existence that the curing longer than 20 hours does not contribute to any additional strength.

His paper was completely based on the study that curing time is directly proportional to the strength of material especially cement related structures.

Ammar Motorwala (2013): He conducted the experimental study in which he thoroughly studies about the structural behaviour of fresh fly ash using geopolymer the main objective of his study was to find the parameters and various concentrations of alkaline solutions that totally contribute the strength especially the compressive strength. He also concluded the fact that strength is completely depended on the molarity. He did curing under sunlight and found the compressive strength to be 17N/mm2. He also concluded the fact that flash is bit expensive and hence it was used in limited quantity. Instead of it, geopolymer concrete is taken in order. He concluded the fact that geopolymer concrete will be a revolutionary product in constructional field.

3. CONCLUSION

- The compressive strength of the material formed by using geopolymer and GGBS increases as more the Geopolymer more will be the strength.
- Addition of Fly ash more than 3% will be will deteriorate the structure.
- Acid resistance of structure made from Geopolymer is high as compared to Ordinary Portland cement.

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