



# Effect of Geo-Activator on Strength and Durability Properties of Geopolymer Concrete

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## To Cite this Article

Bonagani Vamshi Krishna, Gomasa Ramesh and Dr. Annamalai Rangasamy Prakash, "Effect of Geo-Activator on Strength and Durability Properties of Geopolymer Concrete", *International Journal for Modern Trends in Science and Technology*, Vol. 07, Issue 03, March 2021, pp.: 123-126.

## Article Info

Received on 10-February-2021, Revised on 03-March-2021, Accepted on 07-March-2021, Published on 13-March-2021.

## ABSTRACT

*Geopolymer concrete is a special type of concrete used worldwide nowadays. The main use of geopolymer concrete is to reduce global warming in the atmosphere and make the structure in economic condition because of waste materials in geopolymer concrete manufacturing. The major problem worldwide is the increase of CO<sub>2</sub> emissions in the environment, which makes the structure easily damage. So geopolymer concrete is a good solution for all problems relating to the atmosphere and environmental conditions. Much research is going on geopolymer concrete and improving the performance and durability day by day. It has excellent mechanical properties compared to conventional concrete. These various types of binders are used in place of cement to get better results in the concrete structure, and by replacing the cement with the binders, the rate of the heat of hydration also decreases. So, it makes the concrete economically and environmentally friendly concrete.*

**KEYWORDS:** Geopolymer concrete, Binders, Activators, Durability.

## INTRODUCTION

Concrete is a main important material for any construction that is a small or medium or large construction of buildings, industries, and offices. It can be used widely for the construction of any structure. In this, there are different types of concretes are available in the construction industry. This concrete technology plays a major role in developing the concrete and using new concrete techniques and plays an important role in civil engineering. The most used and very important types of concrete are the first one is self-compacting concrete and the second one is geopolymer concrete. This lot of researches are going on both types of concrete. In this geopolymer, concrete is made from waste materials. Concrete is usually made by mixing fine aggregate and coarse aggregate and cement and water and some

admixtures. In this, the important ingredient used in the concrete is cement only. Increasing carbon dioxide in the atmosphere and increasing emissions in the atmosphere and fuel gases leads to substantial material damage. The solution to its problem is to make concrete as a sustainable material and environmentally friendly material. In this geopolymer, concrete is very good for the friendly construction of structures. Different types of ingredients or compositions are used, and they are fly ash and GGBS. The main use of these components in the concrete is reducing carbon dioxide emissions at cement production. Another one is the proper utilization of wastes. In this, binders are used in place of cement. So, it can reduce some problems. Geopolymer concrete is one special type of concrete and can replace cement material with a suitable binder material. The major

use of it is to make the concrete more economical than the cement.



Fig. Geopolymer concrete block

### LITERATURE REVIEW

#### Prakash et al. (2012)

In this research, the paper author explains the importance of geopolymer concrete and the compressive strength of geopolymer concrete. He conducted several experimental works to evaluate the performance of geopolymer concrete. In these tests, concrete and test results' compressive strength is plotted and finally compared with normal conventional concrete. The major notices in these tests are the concrete's strength increases with time and proper curing and temperature.

#### Lavanya et al. (2016)

In this paper, she explained more about ingredients and materials used in concrete. She mainly focuses on the importance of binder material in geopolymer concrete and will be useful in the acidic environment. This author mainly focuses on binder materials in the concrete, such as fly ash and GGBS. This ultrasonic pulse velocity test (UPV) is used to know the concrete material's compressive strength. The compressive strength depends upon the replacement of cement material with binders.

#### Warhade et al. (2014)

In this paper, the author mainly explains on compressive strength of the geopolymer concrete concerning molarity. In this, alkaline solutions are used to check the reactions of the geopolymer concrete. Conducted compressive strength tests for geopolymer concrete, and again it can be checked with NDT test results and compared both the results.

#### Mounika et al. (2015)

This paper explains geopolymer concrete and its properties and binder materials such as fly ash and GGBS. Mechanical properties of geopolymer concrete are determined using an alkaline solution such as NaOH and sodium silicate. Various mechanical properties of geopolymer concrete are determined.

### ADVANTAGES

- Good construction material
- Low cost
- Eco friendly
- Reduce CO<sub>2</sub> emissions
- Good strength properties
- Economical
- Permeability is very low
- Pollution is zero
- Good properties in alkaline and acidic environment
- Reduce global warming

### OBJECTIVES

- High early strength
- Resistance to thawing and freezing
- Strength is more
- No aggregate reaction
- Resistance to acid
- Improve workability
- Resistance to fire
- Corrosion resistance

### METHODOLOGY

- No exact mix design for geopolymer concrete
- Trial mix proportions are taken
- Activators are used
- Binders are used
- Standard cubes and cylinders are used



Fig. Mixing of Aggregates in Binders



### MATERIALS USED

- Fly ash
- GGBS
- Aggregates
- Admixture
- Water
- Geo activator

### PROPERTIES OF GEOPOLYMER CONCRETE

#### Properties of Fly ash

Property	Flyash
Specific gravity	2.36
Fineness	2.83

#### Properties of GGBS

Property	GGBS
Specific gravity	2.71
Fineness	8.33%

### APPLICATIONS

Many applications are thereby using geopolymer concrete in the construction industry. These most useful applications of geopolymer concrete are as follows;

- Bridges
- Pavements
- Piers
- Retaining walls
- Water structures
- Precast elements

- Precast beam
- Boat ramp
- Precast pipes

### LIMITATIONS

- Difficulty in handling
- Sensitive process of mix
- Less uniformity
- More cost-effective for production
- High cost for alkaline solution

### CONCLUSION

The main important conclusion of this paper is

- reduce Co2 emissions
- high early strength
- creep is low
- better resistance than conventional concrete
- shrinkage is low
- excellent properties in any environment
- better than traditional cement

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