

# Geopolymer Concrete: Unique Solution Over Conventional Concrete

<sup>1</sup>Prof. Dhanasri Bhimraj Pawar

Department of Civil Engineering

G.H. Rasoni College of Engineering & Management,  
Chas, Ahmednagar, India

<sup>2</sup>Er. Vikas Vilas Wagaskar

Department of Civil Engineering

G.H. Rasoni College of Engineering & Management,  
Chas, Ahmednagar, India

**Abstract**— Words most consumed construction material is cement used for concrete after the water. concrete is mixture of Water, cement, aggregates and admixtures which provides required properties to concrete. According to IBEF (India Brand Equity Foundation) India is the second largest cement producer in the world according to 2018 survey.[1] In 19 July 2018, the production of cement stood at 28.08 million tonnes.[5] It emits up to 8% Carbon-di-oxide of total worlds Carbon emission. By considering this environmental problems Geopolymer becomes unique solution over conventional Portland cement.

According to The Davidovits patent (2003) Geopolymer emits very lower carbon-di-oxide as compare with ordinary cement. Result of this Environmental pollution and global warming problem reduces.[3]

But on other hand Geopolymer concrete provides high compressive strength, Durability & Workability over Conventional Concrete.[4] Geopolymer concrete is produced from chemical action of Inorganic material. Fly ash, a by-product obtained from thermal power plant is used as inorganic material. fly ash is rich in alumina and silica activated with alkaline activators from alum-inosilicate gel that act as binding material for concrete. due to of Fly as problem of fly ash dumping is also reduces.

This paper reviews the properties of Geopolymer concrete over conventional concrete as best and unique construction material in growing infrastructural development.

**Keywords**— *Geopolymer & conventional Concrete; Fly Ash; Co2 emission; pollution; compressive strength; cost of concrete.*

## I. INTRODUCTION

As India is Developing country, Infrastructure in India developing day by day. New networks of Roadways, Railways, Bridges, Residential & Industrial area grows on increasing. Result of this requirement of primary Binder used in concrete that is Ordinary Portland Cement is also increased. The Worldwide production of cement is High as 2.6 billion tonnes per year and generates nearly 7% carbon-di-oxide. Emission of this huge amount of Carbon-di-oxide being a part of environmental pollution and global warming.[4] Limestone is main constituent in production of cement which results depletion of Limestone. by considering all this drawbacks Geopolymer concrete is unique option for replacement of Ordinary Concrete as construction material.

Geopolymer concrete is a sort of solid that is made by responding aluminate and silicate bearing materials with a burning activator. Regularly, squander materials, for example, fly debris or slag from iron and metal generation are utilized, which causes lead to a cleaner domain. Geopolymer

concrete is referred as “Green concrete”.[3] This was first invented by Dr.WG in Denmark in 1998.

## II. LITERATURE REVIEW

Supriya Kulkarni focused on topic “Study of Geopolymer Concrete”. The study included various topics like Introduction of Geopolymer. Properties of Geopolymer concrete Compressive strength, Durability & Workability. This paper concluded that Geopolymer is shows resistive properties against corrosion and fire. Geopolymer gains 10% more strength in steam curing as compare to water submerged curing.[4]

Swapnil Mandhurkar Tanpure, Mohan N. Shirsath, Sandeep Hake studied the topic “State of Art-Lime Added Geopolymer Concrete”. This review paper discusses addition of Lime to Geopolymer concrete in order to increase solution to binder ration significantly. Compressive strength of GPC increases with addition of slaked lime as it provides extra heat to solution. Finally, they concluded that other methods of curing are difficult on sight. so addition of lime and natural sunlight is best solution for curing on sight.

Sidheshwar Murkute, Madan S.H. and DR.V.A.Patil studied the topic “Comparative study of Green Concrete and Conventional Concrete on Strength and Durability Properties”. This experimental study concluded that Green concrete shows better performance and durability which ensures long lifetime concrete and can be used for conventional work.[1]

Robbie M. Andrew, CICERO (Centre for International Climate Research, Oslo 0349, Norway) focused on topic “Global CO2 emissions from cement production” he stated that According to IBEF (India Brand Equity Foundation) India is the second largest cement producer in the world according to 2018 survey.[5]

J. Davidovits reviewed the topic “False Values on CO2 Emission for Geopolymer Cement/Concrete published in Scientific Papers” he Concluded in his review that in 19 July 2018, the production of cement stood at 28.08 million tonnes. It emits up to 8% Carbon-di-oxide of total worlds Carbon emission. He high lightens the carbon-di-oxide production due to cement factories in various countries. [6]

J.Tharrini & S.Dhivya Reviewed the topic “Comparative Study on the Production Cost of Geopolymer and

Conventional Concretes". From this it has been observed that Geopolymer production cost is less as compare to conventional concrete but it provides higher strength than conventional concrete. [7]

### III. CONSTITUENTS OF GEOPOLYMER CONCRETE[]

#### A. Fly Ash

It is by-product derived from Thermal Power plant. It contains Silica and Alumina in huge percentage. It is used in concrete as partially or Fully replacement to cement.as cement manufacturing process makes global warming and environmental pollution problem.

#### B. GGBFS

Ground-granulated blast-furnace slag is obtained by quenching molten iron slag from a blast furnace in water or steam, to produce a glassy, granular product that is then dried and ground into a fine powder.

#### C. Aggregates

Course aggregates and fine Aggregates are used in Geopolymer concrete.

#### D. Alkaline Solution

Hydroxides and silicates of sodium and potassium are used. It forms binder material for concrete.

### IV. COMPARITIVE STUDY BETWEEN GEOPOLYMER AND CONVENTIONAL CONCRETE

#### A. Strenght[4]

*Geopolymer concrete provides 1.5 times higher than conventional concrete.*

#### B. Durability[3]

Geopolymer concrete shows excellent resistance to sulphate attack. It can be used for marine structures.

#### C. Workability[1]

Addition of extra water imparts strength. But extra use of superplasticizers reduces strength.

#### D. Pollution[6]

Production process of Conventional cement emits huge amount of carbon-di-oxide. This can be reduced by use of Geopolymer concrete.

#### E. Cost of Production[3]

Cost of production of Geopolymer concrete is less as compare to conventional concrete.

### V. CONCLUSION

From this whole review it is concluded that Geopolymer concrete is unique replacement over conventional concrete. In all parameters like strength, durability, workability, pollution & cost Geopolymer is best solution is Infrastructural Development.

### VI. REFERANCES

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