HIGH DENSITY CONCRETE USING DIFFERENT AGGREGATES WITH ADDITION OF GEO POLYMERS AND RICE HUSK ASH

1 Eshanthini .P, 2M. Praba and 3 B. Priyadharshini

Department of Civil Engineering,
Sathyabama Institute of science and Technology, Chennai, India.

e-mail: eshaindia14@gmail.com

Abstract. S Cement Concrete is one of the most important material used in construction, as it provides good ductility and can be moulded into any shape. Normal cement concrete holds a very short tensile strength, limited ductility and little resistance to cracking. It has been initiated that various types of fibers added in exact percentage to concrete expands the mechanical properties, durability and serviceability of the structure. The main aim of the study is to study the strength of M20 grade of concrete by adding rice husk ash and barite comparing with conventional concrete. The admixtures are added from replacing cement with fly ash and GGBS at 25%, 50% & 75% to the volume of cementious material. The mechanical properties namely compressive strength, split tensile strength were carried for concrete specimen at different age level and the basic test was conducted for cement, coarse aggregate and fine aggregate.

Keywords: Barite, GGBS, Flyash, Rice husk ash, Compressive Strength, Split Tensile Strength.

1. Introduction

One of the most devoured man-made materials in construction activity is concrete. It is the blend of cementitious materials, water, aggregates and furthermore various sorts of admixtures in a specific proportion. Plasticity is the one of the key property of fresh concrete, which implies before projecting it acts like plastic yet as time goes, it gets hard like stone. Geopolymer concrete is orchestrated from squander materials like fly ash, rice husk, GGBS, barite and so on, alongside restricting arrangement and is liberated from concrete. Fly ash is a basic material for geopolymer binders, is accessible richly worldwide but then its used to date is restricted. Additionally, the utilization of geopolymer concrete will be reasonable and compelling, fly ash and different materials variety in hatching period and consolidation of concrete as partial substitution. Our project deals with investigating strength of concrete using fly ash as replacement for cement and barite & rice husk as admixtures.
2. Materials

2.1. Fly Ash
Fly ash is a fine powder that is derived from intensely hot pounded coal in electric age power plants. Fly ash is a pozzolan, a substance containing aluminous and siliceous material that structures concrete within the sight of water. Specific gravity of the fly ash is 2.21.

2.2 Fine Aggregate
Factory-made sand is a supplementary of conventional river sand for construction purposes. The m sand was produced from hard granite stone by crushing and the shape of the sand was cubical shape with grounded edges. Local manufactured sand (m-sand) is used in the experimental work. The bulk density of the fine aggregate is 1.57g/cm³.

2.3 Coarse Aggregate
Locally crushed coarse aggregate is used in this experimental work. The nominal size of the aggregate is 12mm and maximum size for the aggregate is 20mm as per is 10262:2009. Bulk density of the coarse aggregate is 1.63g/cm³.

2.4 Barite Powder
Barite is a mineral composed of barium sulfate and it is derived from sedimentary rocks. Barite was used in multidisciplinary fields like industrial, medical, and manufacturing due to its high specific gravity.

![Fig 1. Barite Powder](image1)

2.5 GGBS
The powdered form of Ground Granulated Blast-furnace Slag (GGBS) was derived after drying the by-product of slag. GGBS is used as replacement for cement in this geopolymer concrete. Specific gravity of GGBS is 2.88.

![Fig 2. GGBS](image2)
2.6 Rice husk ash

The end product of paddy crop was rice husk ash which is burn and grounded into fine powder in mills. The powdered ash is then replaced with cement in concrete. This replacement of fine aggregate with rice husk ash provide environment sustainability. Specific gravity of rice husk ash is 2.14.

![Rice husk ash](image)

Fig 3. Rice husk ash

2.7 Plasticizers

To increase the workability of the concrete plasticizers are used. Plasticizers like Na2SiO3 and Na2SO4

3. Method Of Investigation

3.1 Determination of hardened properties

In this investigation, the following tests on hardened were carried out

a) Compressive strength
b) Split Tensile strength

4. Experimental Procedure

4.1 Preparation and casting of test specimens

Using the M20 mix proportion the concrete were mixed. Initially the concrete were mixed without admixtures for conventional cubes & moulds, then barite is added with proper mix proportion using a steel rod the concrete were tamped well to avoid voids (or) air bubbles. The specimen de-moulded after 24hours and then placed in a curing tank for 7,14&28days and then the specimen were taken out from curing tank and allowed air to dry for 12 hours and then the test will be conducted.
5. Results and Discussions

5.1 Compressive Strength

From the test result, it is observed that with increase in fiber percentage the compressive strength also increases up to 1.5% after that the compressive strength starts to decrease in polypropylene, and in steel also it decreases after 1.5%.

| SAMPLE 1 | IDENTIFICATION | 28 DAYS | 7 DAYS |
|----------|-----------------|---------|--------|
| BARITE   | kN   | N/mm² | kN   | N/mm² |
| 770      | 34.22 | 425   | 18.88 |
| 760      | 33.78 |        |       |
| 775      | 34.44 | 430   | 19.11 |
| 770      | 34.22 |        |       |
| 765      | 33.55 | 420   | 19.20 |
| 760      | 33.78 |        |       |
5.2 Split Tensile Strength

From the test result, it is observed that with increase in fiber percentage the compressive strength also increases up to 1.5% after that the compressive strength starts to decrease in polypropylene, and in steel also it decreases after 1.5%.

Fig 6. Testing of Specimen
6. Conclusions

From the present experimental study the results obtained, the following conclusions may be drawn:

- The increase in compressive strength, split tensile strength of geopolymer concrete was achieved by replacing barite with sand.
- Addition of barite increases the workability of concrete. The split tensile strength increasing when comparing to conventional concrete.
- Strength enhancement of split tensile strength for 100% usage of barite is more efficient than conventional concrete.
- The experimental study proved to be the best method or way in providing strong and durable concrete. It is observed that 100% barite replacement in concrete yields more strength.
- The experiment shows that the effect of addition of barite and usage of geopolymers can proves to be effective to overcome brittleness of concrete.
References

[1] Dr. Asif Hussain, Mir Fairoz Akhter and Faiyaz Azam
Comparative study on effect of Fly Ash and Rice Husk Ash on Strength of Concrete, International Journal of trend in Scientific, 2018.

[2] Benny Joseph, George Mathew Influence of aggregate content on the behaviour of fly ash bashed geopolymer concrete, Scientia iranica, 2017.

[3] P. Chindaprasirt and S. Detphan, Preparation of fly ash and rice ash and husk ash geopolymer, Elsevier, 2014.

[4] Elsayed A. Waly and Mohamed A. Bourham, Comparative study of different concrete composition as gamma-ray shielding materials, Elsevier, 2015.

[5] Mohamed Alwaeli, Investigation of gamma radiation shielding and compressive strength properties of concrete, Journal of Cleaner Production, 2012.

[6] Nurhasmi, Bualkar, Sultan, Geo polymer concrete for radiation shielding applications, Scientia iranica, 2017.