EXPERIMENTAL INVESTIGATION ON GEOPOLYMER CONCRETE BY USING DIFFERENT MINERAL ADMIXTURES

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ABSTRACT

Building construction plays an important role as the world is developing rapidly. Consistent management will increase concrete consumption and result in a shortage of natural resources. By replacing many parts of concrete with the following means, we save much of our natural resources. Use ash and GGBS as a mixture of geopolymer concrete in the same proportions (50-50%). Compressive Strength, Results of 7- and 28-day-old split durability tests Strength-Polymer concrete is an increasingly popular building material in recent years simply because it is much more environmentally friendly than the standard concrete polymer. It is one of Concrete can be a variety of concrete by reacting aluminate and siliceous materials with caustic activators. Wastes such as ash and slag from the production of iron and metals are usually used to contribute to a cleaner environment. Geopolymer concrete completely replaces cement with ash, blast furnace slag, and polymer materials.

Keywords: Fly Ash, Sodium Hydroxide And Sodium Silicate, GGBS.

I. INTRODUCTION

Concrete is a widely used building material that makes the finest foundations, building structures, bridges, roads, log walls, fences and piles. The production of 1 ton of Portland cement emits about 1 ton of CO2 into the atmosphere. Of the greenhouse gases, CO2 accounts for about 65% of global warming. The contribution of ordinary Portland cement (OPC) production to global greenhouse gas emissions is estimated to be approximately 1.35 billion tons per year, or approximately 7% of the total greenhouse gas emissions to the Earth's atmosphere. However, the cement industry is very energy consuming. Following aluminum and steel, Portland cement production is the most energy-intensive process, using 4 GJ of energy per ton. India's cement industry is the third largest coal consumer in the country after thermal power plants and the steel sector. At the beginning of 2008/09, the industry's production capacity was approximately 198 million tons.

II. OBJECTIVE

The aim of the project is to study the strength difference between the two geopolymer concrete using 3 different mineral admixtures for two different ages. The present study is limited to check the strength behaviour of the geopolymer concrete made of different mineral admixtures.

III. MATERIALS

In this project the following materials are used; Fly ash, ggbs, alkaline solution: sodium hydroxide, sodium silicate, sand.

Table 1: Physical properties of binding materials used

<table>
<thead>
<tr>
<th>S.no</th>
<th>Physical Properties</th>
<th>Fly Ash</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Colour</td>
<td>Light grey</td>
</tr>
<tr>
<td>2.</td>
<td>Specific Gravity</td>
<td>2.3</td>
</tr>
</tbody>
</table>
IV. EXPERIMENTAL RESULTS

4.1 COMPRESSIVE STRENGTH TEST

The cube specimens of 150mm x 150mm x 150mm were cast and tested in compression testing machine for 7 and 28 days of curing period for different proportions of concrete mix and presented in table below.

<table>
<thead>
<tr>
<th>S.no</th>
<th>Molarity</th>
<th>7 days (N/MM²)</th>
<th>28 days (N/MM²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NC</td>
<td>26.91</td>
<td>39.12</td>
</tr>
<tr>
<td>2</td>
<td>12M</td>
<td>30.53</td>
<td>43.68</td>
</tr>
<tr>
<td>3</td>
<td>14M</td>
<td>30.97</td>
<td>45.09</td>
</tr>
<tr>
<td>4</td>
<td>16M</td>
<td>31.94</td>
<td>45.76</td>
</tr>
</tbody>
</table>

4.2 SPLIT TENSILE STRENGTH TEST

At the age of 7 and 28 days, the cylindrical specimens (150mm diameter x 300mm height) were tested for evaluating the split tensile strength. The test results for the split tensile strength for the two mixes are presented in the below table.

<table>
<thead>
<tr>
<th>S.no</th>
<th>Activator Ratio</th>
<th>7 days (N/MM²)</th>
<th>28 days (N/MM²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NC</td>
<td>2.65</td>
<td>3.86</td>
</tr>
<tr>
<td>2</td>
<td>12M</td>
<td>2.96</td>
<td>4.26</td>
</tr>
<tr>
<td>3</td>
<td>14M</td>
<td>2.99</td>
<td>4.38</td>
</tr>
<tr>
<td>4</td>
<td>16M</td>
<td>3.08</td>
<td>4.47</td>
</tr>
</tbody>
</table>

V. CONCLUSION

1. In the context of this analysis, it is observed that geopolymer concrete made of fly ash at 12M of NaOH with alkaline ratio of 1:2 (NaOH/Na₂SiO₃) gives a compressive strength of 30.53 Mpa & 43.68 Mpa for 7 days and 28 days age.
2. In the context of this analysis, it is observed that geopolymer concrete made of fly ash at 14M of NaOH with alkaline ratio of 1:2 (NaOH/Na₂SiO₃) gives a compressive strength of 30.97 Mpa & 45.09 Mpa for 7 days and 28 days age.
3. In the context of this analysis, it is observed that geopolymer concrete made of fly ash at 16M of NaOH with alkaline ratio of 1:2 (NaOH/Na₂SiO₃) gives a compressive strength of 31.94 Mpa & 45.76 Mpa for 7 days and 28 days age.
4. In the context of this analysis, it is observed that geopolymer concrete made of fly ash at 12M of NaOH with alkaline ratio of 1:2 (NaOH/Na₂SiO₃) gives a split tensile strength of 2.96 Mpa & 4.26 Mpa for 7 days and 28 days age.
5. In the context of this analysis, it is observed that geopolymer concrete made of fly ash at 14M of NaOH with alkaline ratio of 1:2 (NaOH/Na₂SiO₃) gives a split tensile strength of 2.99 Mpa & 4.38 Mpa for 7 days and 28 days age.
VI. REFERENCES

[1] Sasi Rekha M.\textsuperscript{1*} and Sumathy S.R.\textsuperscript{2}. A study on cement-free geopolymer concrete incorporated with industrial waste cured at open environment for different molarities of sodium hydroxide, Global NEST Journal, 23(2), (2021), 265-274.


[6] Dr. K. Chandramouli\textsuperscript{1}, Dr. N. Pannirselvam\textsuperscript{2}, J. Sree Naga Chaitanya\textsuperscript{3}, Amani. Experimental Investigation of Micro Silica Based on Geopolymer Concrete by Using Coconut Fibres, INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN TECHNOLOGY, 8(5), (2021), 36-40.


[9] P. Kavya\textsuperscript{1}, Dr. K. Chandramouli\textsuperscript{2}, J. Sree Naga Chaitanya\textsuperscript{3}, Dr. N. Pannirselvam\textsuperscript{4}, G. Hari Chandra Prasad\textsuperscript{5}. Strength Behaviour of Geopolymer Concrete by Using Different Mineral Admixtures, Journal of Emerging Technologies and Innovative Research, 8(8), (2021), 951-954.

