Partial replacement of coarse aggregates in concrete structures

S. Pradeep Saravanan*
Department of Civil Engineering, Bharath University, Chennai, Tamilnadu, India
*Corresponding author: E-Mail: s_pradeep@gmail.com

ABSTRACT

The usage of plastics in our day to day life have been increased gradually and this increased level causes substantial garbage which is unhealthy. Plastics can be recycled and can be used in many manners, in that case the recycled plastics are suitable for replacing coarse aggregates in the production of concrete structures. This paper discuss about the suitability and advantages of plastics in the production of concrete. Since 100% replacement is not feasible partial replacements are done with the percentage level were examined. The 30% of partial replacement was having the higher compressive strength.

KEY WORDS: Coarse, Structures, Partial.

1. INTRODUCTION

Concrete is the mostly used construction material in the world next to water since it is the most uses substance in the planet. In this study recycled plastics were used to replace the coarse aggregates which deals with the plastic waste. Failures occur among the concrete structures mostly due to the crushing of aggregates. So it is better to utilize the recycled plastics for construction instead recycling it repeatedly.

Plastic aggregate: Plastic waste will be collected and washed and crushed. Later then it will be heated to make it to attain its brittleness and then it will be allowed to cool down and it will be later crushed to get the shape of aggregates. The properties as per IS will be examined. Thus the PCA property is much lower than NCA property.

Table 1. Properties of Aggregate

<table>
<thead>
<tr>
<th>Property</th>
<th>NCA</th>
<th>PCA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific gravity</td>
<td>2.74</td>
<td>0.9</td>
</tr>
<tr>
<td>Crushing value</td>
<td>28</td>
<td>2</td>
</tr>
<tr>
<td>Density</td>
<td>3.14</td>
<td>0.81</td>
</tr>
</tbody>
</table>

Experimental investigation: The properties of both NCA and PCA were detected by conducting test for compressive strength, compaction factor as per the IS and they are tabulated in table 2. the workability of the 30% PCA concrete more because the PCA concrete absorbs less water due to the presence of plastics.

Table 2. Fresh properties of concrete

<table>
<thead>
<tr>
<th>Particulars</th>
<th>NCA</th>
<th>30% replaced with pca</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slump</td>
<td>30</td>
<td>31</td>
</tr>
<tr>
<td>Compaction Factor</td>
<td>0.90</td>
<td>0.91</td>
</tr>
</tbody>
</table>

Volumetric substitution: In the volumetric substitution method the volume occupied by the PCA concrete is more than that of the NCA. The cube dimension is (150 x 150 x 150 )mm and its compressive strength is obtained for various level of percentage in that case the 30% substitution PCA concrete has more better strength than the NCA.

Structural behavior: The concrete is molded in the means of cube and cylinder and various test were conducted to determine the compressive strength and tensile strength and elasticity modulus and their values are tabulated below.

Photographic view of tests conducted:
Table 3. Structural properties of concrete

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Cylinder Compressive Strength In Mpa</th>
<th>Splitting Tensile Strength In Mpa</th>
<th>Modulus Of Elasticity In Mpa</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCA</td>
<td>10.8</td>
<td>1.87</td>
<td>15190</td>
</tr>
<tr>
<td>30 % PCA</td>
<td>15.17</td>
<td>0.81</td>
<td>12638</td>
</tr>
</tbody>
</table>

2. CONCLUSION

To determine the suitability of PCA concrete for structural concrete tests were conducted and in that test NCA has more compressive strength based on the tensile strength and bonding strength of PCA. [18-21] PCA concrete showed reduction in tensile strength and elastic modulus.

3. ACKNOWLEDGMENT

My foremost gratitude goes to all that have contributed in the achievement of this study. I am grateful to the Honorable Chancellor, Dr. J. Sandeep Anand, Bharath University, Chennai. I am grateful to Mr. P. Dayakar, Head of the Department, Civil Engineering, Bharath University, Chennai. I am sincerely grateful to my respondents who helped me to carry out my project successfully.

REFERENCES


Vanangamudi S, Prabhakar S, Thamotharan C, Anbazhagan R, Drive shaft mechanism in motor cycle, Middle East Journal of Chemical and Pharmaceutical Sciences.


Zoorob, S., E., Suparma, L., B., Laboraty design and investigation of the properties of continuously graded Asphaltic concrete containing recycled