

COMPARATIVE ANALYSIS OF PHYSICAL PROPERTIES OF PLASTIC COATED AGGREGATES

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ABSTRACT

Plastic waste is increasing because of population growth, development and urbanization. The disposal of waste plastic has become a serious problem globally due to their non-biodegradability. Plastics can be divided into two major categories: thermoset and thermoplastics. Therefore it is essential to utilize the wastes effectively in each field. Use of this waste mix for road construction helps to use plastic waste. Once the plastic waste is separated from solid waste, the organic matter can be transformed into manure and utilized. This study was aimed at showing the effect of different content of plastic by weight on the aggregates properties. The % of plastic content adopted for the study was 0%, 2%, 3% and 5%. The methodology for the making of plastic coated aggregates is discussed in the study. The improvement in physical properties of aggregated due to coating of plastic can widen the scope of plastic coated aggregates in concrete pavements also.

INTRODUCTION

Plastics are a resourceful material and a friend to common man. In recent years, applications of plastic considered in road construction with great interest in many developing nations. The use of these materials in road making is based on economic, technical and ecological criteria. Waste plastic like wrappers, carry bags, plastic bottles etc. can be used. The waste plastic used in this study in the process of making of plastic coated aggregates was carry bags. A defined methodology is adopted and followed in this study for the making of plastic coated aggregates.

METHODOLOGY

Following Approach is adopted for the study:

- I. Plastic waste collection
- II. Plastic waste shredding
- III. Sieving of aggregate
- IV. Heating of aggregate
- V. Mixing of aggregate with shredded plastic
- VI. Test on aggregate

SCOPE OF THE WORK

The waste plastic used in this project was the carry bags. The carry bags were collected, cleaned and shredded. The shredding of plastic was done manually using cutters. The size of shredded plastic was about 4.75 mm. the aggregates passing 12.5 mm and retained on 10 mm were heated in an oven to a temperature of 160°C.

MIXING OF SHREDDED PLASTIC WITH AGGREGATES

The aggregate mixed with plastic in different proportions i.e. 0%, 2%, 3%, 5%. The process of mixing is a bit different as the shredded plastic was sprayed over the heated aggregates and the mixed properly and uniformly till a layer of plastic was coated over the aggregates. After mixing, the aggregates allowed to cool down for 3 hrs. And then further test were performed.

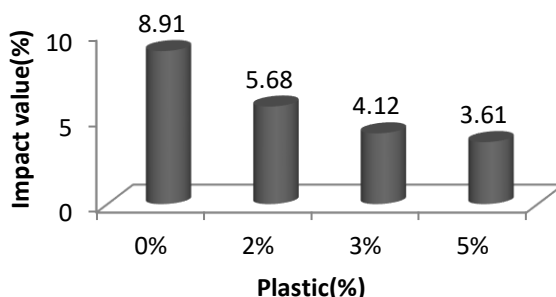
TEST DONE ON AGGREGATES

The following tests carried out on the aggregates to test their physical properties.

- I. Impact test
- II. Los Angles Abrasion test
- III. Crushing strength test
- IV. Water absorption test
- V. Stripping value

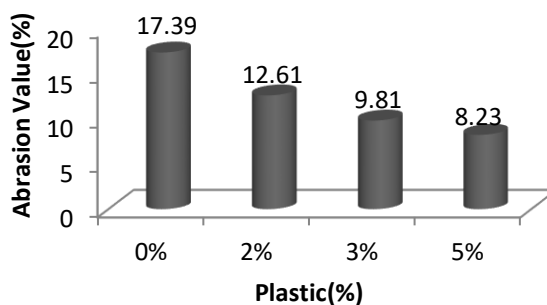
IMPACT TEST

This test was done to evaluate the resistance of aggregates to fracture under repeated loading. The normal aggregates were tested first and then plastic coated aggregates with percentage of plastic content varying from 2%, 3% and 5%.



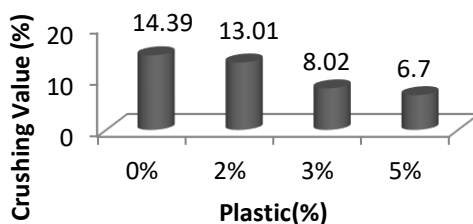
LOS ANGLES ABRASION TEST

This test was done for measuring the abrasion resistance of aggregates. The top layer of pavement gets abraded due to movement of traffic. The aggregates retained on 10mm sieve and passed through 12.5 mm sieve were used for this test.



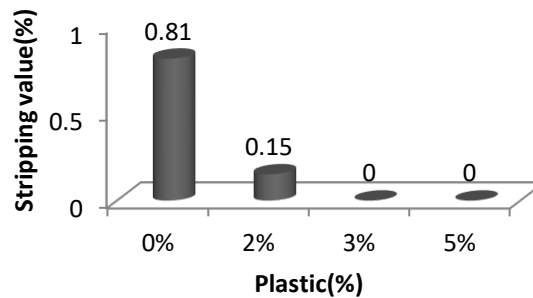
CRUSHING STRENGTH TEST

This test was done to evaluate the aggregates crushing strength to check the strength under severe stress. The normal aggregates were tested first and then plastic coated aggregates were tested with percentage of plastic content varying from 2%, 3% and 5%.



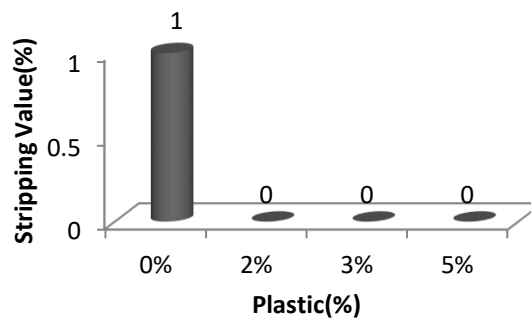
WATER ABSORPTION TEST

This test was done to determine the water absorption value of aggregates. Water absorption depends on the pores in the aggregates. The tests were done for each of the samples separately and the results are tabulated as shown.



STRIPPING VALUE TEST

This test was done to determine the stripping value of aggregate by static immersion method. The aggregates retained on 10mm sieve and passed through 12.5 mm sieve were used for this test. The normal aggregates were tested first and then plastic coated aggregates were tested with percentage of plastic content varying from 2%, 3% and 5%. The tests were done for each of the samples separately.



RESULTS

Plastic Content (%)	Impact value (%)	Abrasion value (%)	Crushing Value (%)	Water Absorption (%)	Stripping value (%)
0	8.91	17.39	14.39	0.81	1
2	5.68	12.61	13.01	0.15	0
3	4.12	9.81	8.02	0	0
5	3.61	8.23	6.7	0	0

CONCLUSION

Based on the study following conclusions are obtained:

Coatings of plastic on aggregates enhance the physical properties of aggregates and these aggregates can be used in the construction of flexible pavement to give an improved strength and quality service life.

1. The aggregate impact value for normal aggregates (0 % plastic content) was observed as 8.91% which is improved to 3.61% at 5% plastic content.
2. The aggregate abrasion value for normal aggregates (0 % plastic content) was observed as 17.39% which is improved to 8.23% at 5% plastic content.
3. The aggregate crushing value for normal aggregates (0 % plastic content) was observed as 14.39% which is improved to 6.7% at 5% plastic content.

4. Water absorption was 0.81% for normal aggregates (0 % plastic content) which decreases to 0% for 5% plastic content.
5. The stripping value for normal aggregates (0 % plastic content) was observed as 1.00 % which decreases to 0% at 5% plastic content.

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