

Experimental Study on using Basalt as a Construction Material

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Abstract

The innovation in construction materials is increasing day by day. This paper aims to study using basalt as a base material for construction. Basalt is an igneous rock found widely in a Deccan plateau. It had been used for aesthetic purposes like cobblestones and to made a statue etc. To use this basalt in the construction, tests have been conducted to find the chemical composition and property of Basalt. The chemical composition of basalt has been analyzed using reagents. Various property tests such as specific gravity and water absorption test, impact value test, and crushing value test has been carried out. From the analysis, the following properties have been found in the basalt as the property of carbon sequestration, low moisture content

Keywords - Basalt, property test, chemical composition.

I. INTRODUCTION

The construction sector is growing rapidly and innovatively in recent years. The need for innovative materials in construction to increase the strength and durability has become mandatory. Here the research aims to study the feasibility of using basalt in construction. The basalt property for construction is investigated by conducting property tests and analyzing the material's chemical composition. Once the basalt stone's property is suitable for construction, it can play a major role in the construction field.

II. BASALT

Basalt is a mafic extrusive igneous rock formed from the rapid cooling of lava exposed to the planet. More than 90% of volcanic rock on earth is basalt. Carbon sequestration in basalt has been studied as a means of removing carbon dioxide produced by human industrialization. Basalt can be used in construction in various forms. In past years, basalt has been used to make tiles and slabs for aesthetic and architectural applications. The very dark green color or black formed when the molten lava in the earth's crust rises and solidifies.



Fig 1: Sample of Basalt

III. APPLICATIONS

Basalts are used in the construction of stadiums. One of the special application of basalt is grinding stone in the Mills for grinding purposes. Groundwork utilizes basalt for the stabilization of soil. For aesthetic purposes, basalts are used in the form of Cobblestones. In drainage, these stones are used as a filter medium. Some of the statues are also made with Basalt stone.

IV. BASIC PROPERTIES

Basalt has a dense, fine-grained texture. It is an excellent thermal insulator and has a good frictional property. The Hardness of Basalt on mohr's scale is 6. The special property of basalt is Carbon sequestration: Barrier to release CO₂. The basalt in graded aggregate form is moisture-free. It also acts as an excellent UV resistance.

V. CHEMICAL COMPOSITION

The chemical composition of basalt used in this research was tested with the Indian Bureau of mines. This codal provision helps to find the composition of the mineral sample. The appropriate reagents have been used to find the following compound percentage. The chemical analysis has been conducted with mineral samples and chemical reagents to find the composition. The percentage of the following compounds has been found from the chemical analysis, which shows that the basalt material is chemically well suitable for construction, which does



not cause any reaction with the other material to be used with it.

TABLE 1: chemical composition of basalt specimen

COMPOUND	PERCENT
Silicon dioxide	46.2
Aluminum oxide	14.0
Iron oxide	15.1
Calcium oxide	8.2
Magnesium oxide	6.92
Sodium oxide	3.82
Potassium oxide	1.96
Titanium oxide	2.1
Other oxides	1.5

VI. EXPERIMENTAL WORKS

The experimental work includes laboratory testing for basalt to find the efficiency of using basalt as a construction material.

VII. LABORATORY TESTS

Various tests have been conducted as per ASTM standards in the laboratory to find basalt construction material property. The observation and results are discussed below.

A. Specific gravity test

From the test results, basalt's specific gravity is **2.82**, higher than the normal aggregate. The higher the specific gravity higher is quality of the specific material. Hence the basalt has a good quality, which is suitable for construction.

B. Impact value test

It is the test to be conducted to find the resistance of basalt against the impact load. The result acquired from this test is **15%**, which comes under the category of strong material. From this, we can infer that the basalt can be well suitable for pavement construction.

C. Crushing value test

The crushing test is conducted to find the resistance of basalt against the compression load. The value obtained for basalt is **5%**, which comes under the very strong category. This shows that the basalt in the concrete mix will increase the strength of the concrete.

D. Water absorption test

The water absorption capacity from the test results is **1.5%**. Hence the basalt has a low water

absorption capacity. Material that has a low absorption capacity will have higher dehydration.

VIII. RESULT AND DISCUSSION

The above test results show that the basalt is very strong against impact load, and it also has a good resistance against the compressive load than the normal coarse aggregate. The water absorption test result shows that the absorption capacity of basalt is within the standard limits. The specific gravity test shows that the basalt has higher specific gravity.

IX. CONCLUSION

This research intends to find the construction property of basalt is fulfilled from the laboratory test results. As a whole, the basalt has a very construction property, used in the construction to increase the strength. This is mainly because the basalt is denser and more durable. The resources for basalt are high so, it can be utilized economically.

REFERENCES

- [1] p.ramteja, Basalt Aggregate as Coarse Aggregate in High Strength Concrete Mixes, International Research Journal of Engineering and Technology (IRJET),.03(08),(2016)
- [2] Swati Jha, Prakhar Duggal, and Chiku Agarwal, To Study the Durability Aspects of Concrete using Basalt Aggregate Indian Journal of Science and Technology, 9(30),(2016).
- [3] T. Parthiban, G. Pavithran, C. Pradeep, BA. Praveen Kumar, Mrs. Devi S, Durability of Concrete by adding basalt fiber International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056,.4(09),(2017).
- [4] I.Siva Kishore, L.Mounika, C.Maruti Prasad and B.Hari Krishna, Experimental Study on the Use of Basalt Aggregate in Concrete Mixes SSRG International Journal of Civil Engineering (SSRG-IJCE) –2(4), (2015).
- [5] Hamadallah Mohammad Al-Baijat, The Use of Basalt Aggregates in Concrete Mixes in Jordan Jordan Journal of Civil Engineering, 2(1), (2008).
- [6] Sigurdur R. Gislason*, W.S. Broeckerb, E. Gunnlaugssonc, S.Snæbjörnsdóttira,K.G.Mesfina, H.A. Alfredsson, E.S. Aradóttir, B. Sigfussonc, Rapid solubility and mineral storage of CO₂ in basalt, Energy Procedia., 63,(2014),4561 – 4574.
- [7] M.S.Shetty [Hand book – concrete technology].
- [8] Mohammad Athar Hussain Compressive Strength Characteristic of Concrete Incorporating Marble Powder and Stone Dust as Partial Replacement of Cement and natural sand International Research Journal of Engineering and Technology
- [9] P. D. Kumbhar and P. B. Murnal, A New Mix Design Method For High-Performance Concrete Under Tropical Concrete, Asian Journal of Civil Engineering (BHRC),.15(3), (2014).
- [10] R.Mahipal Effect Of Different Types Of Coarse Aggregates On Physical Properties Of Mostly Used Grades M20, M25, M30 Of Concrete Ijariie-Issn(O)-2395-4396.
- [11] IS 456 – 2000 (Fourth Revision) Indian Standard Plain and Reinforced Concrete Code of Practice.
- [12] IS: 383-1970 (Second Revision), Specifications for coarse and Fine Aggregates from Natural Resources for Concrete