

Experimental Study of Basalt Fiber with Silica Fume in Reinforced Concrete

Utkarsh Gajanan Mohokar, Sandip Namdeo Moghekar, Hemant Gajanan Agase,
Shubhangi Laxman Nagargoje, Rutvik Sanjay Kadam, Prof. P. M. Wale

Department of Civil Engineering
Sinhgad Institute of Technology and Science, Pune, India

Abstract: *This research paper presents a comprehensive experimental study on the mechanical properties and durability characteristics of Basalt Fiber Reinforced Concrete (BFRC) incorporating silica fume. The objective of this study is to investigate the potential benefits of combining basalt fiber reinforcement with silica fume in concrete mixtures and evaluate their impact on the performance of concrete structures. The experimental program encompasses a series of tests conducted on BFRC specimens with varying percentages of basalt fibers and silica fume. The mechanical properties, including compressive strength, flexural strength, and splitting tensile strength, are evaluated to assess the effect of basalt fiber and silica fume on the structural behaviour of the concrete. Additionally, water absorption tests are conducted to examine the durability characteristics of the BFRC mixtures.*

The incorporation of basalt fibers in concrete aims to enhance the tensile strength and improve the resistance to cracking and deformation. Basalt fibers exhibit superior properties such as high tensile strength, excellent corrosion resistance, and low thermal conductivity. On the other hand, silica fume, a by-product of the silicon and ferrosilicon alloy industries, is known for its pozzolanic properties, which contribute to increased strength, reduced permeability, and improved durability of concrete. By combining these two supplementary materials, the study explores the synergistic effects and potential advantages they offer to the overall performance of concrete structures. The findings of this research will provide valuable insights into the feasibility and effectiveness of utilizing BFRC with silica fume, thereby facilitating the development of more sustainable and resilient concrete materials.

The results obtained from this experimental investigation will be analyzed and interpreted to assess the influence of varying basalt fiber and silica fume percentages on the mechanical and durability properties of BFRC. The outcomes will contribute to the existing body of knowledge on the behavior of BFRC with silica fume and help in optimizing the mix proportions for different applications.

Keywords: Basalt Fiber Reinforced Concrete (BFRC), Silica fume, Mechanical properties, Durability characteristics, Compressive strength, Flexural strength, splitting tensile strength

REFERENCES

- [1]. ACI Committee 544. (2014). State-of-the-Art Report on Fiber Reinforced Concrete. ACI 544.1R-96. American Concrete Institute.
- [2]. ASTM C39/C39M-20. (2020). Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens. ASTM International.
- [3]. ASTM C496/C496M-17. (2017). Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens. ASTM International.
- [4]. Mehta, P. K., & Monteiro, P. J. M. (2014). Concrete: Microstructure, Properties, and Materials (Fourth Edition). McGraw-Hill Education.
- [5]. Mindess, S., & Young, J. F. (2009). Concrete (2nd Edition). Prentice Hall.
- [6]. Neville, A. M. (2011). Properties of Concrete (Fifth Edition). Pearson Education Limited.
- [7]. Pacheco-Torgal, F., Tam, V. W., & Labrincha, J. A. (2013). Handbook of Alkali-Activated Cements, Mortars and Concretes. Woodhead Publishing.

- [8]. Shah, S. P. (1994). Fiber Reinforced Concrete: An Overview. *Journal of Advanced Concrete Technology*, 2(1), 5-17.
- [9]. Silva, F. D., Toledo Filho, R. D., & Fairbairn, E. M. R. (2018). Influence of Basalt Fiber Addition on Mechanical Properties of Concrete: An Overview. *Construction and Building Materials*, 162, 306- 316.