ABSTRACT

A Comparative Study of Fly Ash and Silica Fume SF-94 Based Geopolymer Coarse Aggregate Production: Properties and Comparison with Natural Coarse Aggregate

Welly Williyanto. [1]), Harianto Hardjasaputra.[2])

1) *Civil Engineering Student, Pembangunan Jaya University*

2) *Lecturer, Civil Engineering Program, Pembangunan Jaya University*

Conventional concrete, with its massive use of natural coarse aggregates, has come under scrutiny due to its significant environmental impact. This research offers an innovative solution by developing eco-friendly geopolymer coarse aggregates made from fly ash, a byproduct of coal-fired power plants, and silica fume. This study explores the fabrication of geopolymer coarse aggregates with silica fume substitutions of 0%, 5%, and 10%. Geopolymer aggregates were successfully produced with promising physical and mechanical characteristics. The density and water absorption of the aggregates varied depending on the silica fume content, indicating its influence on the material's density and porosity. Gradation analysis showed that the geopolymer aggregates possess a suitable gradation for construction. Los Angeles testing measured the aggregate wear, with average results below 40% for all silica fume substitutions, demonstrating the aggregates' resistance to wear and abrasion. Key findings revealed that geopolymer aggregates with 5% silica fume substitution exhibited optimal performance in terms of density, water absorption, and wear resistance. This highlights the potential of silica fume to enhance the quality of geopolymer aggregates. This research opens new avenues for the utilization of fly ash and silica fume as eco-friendly alternative raw materials in the construction industry. Geopolymer aggregates offer a sustainable solution to mitigate the environmental impact of conventional concrete while introducing a robust and durable construction material. Further research with varying silica fume substitution proportions, crushing tests, and the implementation of geopolymer aggregates in real construction products are recommended to solidify the potential of this innovative material.

Keywords: coarse aggregate, silica fume, fly ash, geopolymer aggregate, physical and mechanical characteristics.

Libraries : 24

Publication Years : 1991 – 2023