SCHOLARLY PUBLICATIONS
School of Civil Engineering
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Journal Name: Infrastructures **IF: 2.6**

Title: Durability, Capillary Rise and Water Absorption Properties of a Fiber-Reinforced Cement-Stabilized Fly Ash–Stone Dust Mixture

Author: Sanjeeb Kumar Mohanty, Nirmal Kumar Pandit, Pawan Kumar Sah, Niraj Mahaseth, Rajesh Yada, Dipti Ranjan Biswal, Benu Gopal Mohapatra, Brundaban Beriha, Ramachandra Pradhan and Sujit Kumar Pradhan

Details: Volume 9, Issue 2, January 2024

Abstract: The management of unutilized fly ash poses challenges due to concerns about storage and its potential groundwater contamination. Within the road industry, where the bulk utilization of fly ash is feasible, its unsuitability for use in the base and sub-base layers of pavements due to its low strength and a high proportion of fine particles has been a limitation. The incorporation of stone dust alongside fly ash, treated with lime or cement, yields superior strength and stiffness. Apart from strength, the stabilized mix's durability, capillary rise, and water absorption properties are crucial for determining its suitability for pavement applications. Observations from this study reveal that fiber-reinforced cement-stabilized fly ash–stone aggregate specimens treated with 4% and 6% cement, with and without fibers, met the limiting mass loss of 20%, as specified in IRC SP: 89. The mass loss decreases with an increase in cement and fiber content. However, the capillary rise in the mixes increases with a higher percentage of fly ash and fiber content but decreases with increased cement content. Cement addition results in a reduction in water absorption; however, the addition of fibers results in an increase in water absorption. A linear correlation has been established between mass loss and UCS and IDT, which can be used to evaluate the suitability of materials for the structural layer without conducting a wet–dry durability test, which typically takes one month. This study proposes that cement-stabilized fly ash and stone aggregate mixtures with 4% and 6% cement can be used as the subbase and base of pavement based on wet–dry mass loss criteria and water absorption criteria.

URL: https://www.mdpi.com/2412-3811/9/2/17

SCHOLARLY PUBLICATIONS
School of Civil Engineering
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Journal Name: Iranian Journal of Science and Technology, Transactions of Civil Engineering
IF: 2.6

Title: Strength, Wear-Resistance, Degree of Hydration, Energy and Carbon Performance of Concrete Using Ferrochrome Waste Materials

Author: Prasanna Kumar Acharya and Sanjaya Kumar Patro

Details: Volume 48, Pages 353–362, February 2024

Abstract: Ferrochrome ash (FCA) and air-cooled ferrochrome slag (ACFS) are two waste materials of the ferrochromium industry. Both have excellent engineering properties to be used as building materials. FCA possesses properties of cementitious material, whereas ACFS possesses properties of coarse aggregate. This study examines some properties of concrete on the combined use of lime-activated FCA for the potential replacement of cement and ACFS for the total replacement of natural coarse aggregates. Concrete mixtures were prepared to replace cement by FCA 0–40% at an interval of 10%, using ACFS as coarse aggregates. Mechanical properties such as compressive strength and modulus of elasticity of FCA–ACFS concrete were compared to the established standards of normal concrete. The durability of such concrete as wear resistance was addressed. The microstructure of FCA–ACFS concrete was studied through the degree of hydration. Environmental impact aspects like embodied energy and carbon were studied. Besides, the sustainability of FCA–ACFS concrete was examined by comparing the environmental parameters such as embodied energy and embodied carbon with the functional parameters like compressive strength. The results related to strength, durability, microstructure, environmental impact and sustainability showed the positive effect of ACFS and FCA. Sustainable concrete with improved engineering properties can be prepared using FCA and ACFS.

URL: https://link.springer.com/article/10.1007/s40996-023-01310-8

SCHOLARY PUBLICATIONS
School of School of Civil Engineering
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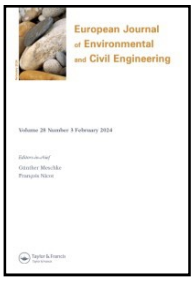
Journal Name: Frontiers of Computer Science **IF: 2.1**

Title: Strength, life cycle analysis, embodied energy and cost-sensitivity assessment of sugarcane bagasse ash-based ternary blends of geopolymer concrete

Author: Tripathy, Amaresh; Acharya, Prasanna Kumar

Details: Volume 28, Issue 3, 2024, Page 591-610

Abstract: The sustainability of cement concrete is always a subject of concern and hence, less polluting concrete alternatives are being explored. Geopolymer concrete can be an alternative, which may be partly or fully cement-free. However, there exists a huge gap in the knowledge of quantification for ecological advancements that can be achieved. This study reports on the life cycle assessment (LCA) of five different geopolymer concrete mixes made up of ternary blends of sugarcane bagasse ash, blast furnace slag and fly ash. The results coupled with 28-day mechanical test results were compared with traditional cement concrete of similar grade. Correlation analysis was carried out among the obtained results to determine Pearson's coefficient and Spearman's rho factor. The aspect of cost and embodied energy was also studied simultaneously. The analyses showed that conventional concrete is more harmful in all ecological impact categories as compared to other alternative concretes except majorly Ozone layer depletion, Carcinogens and Mineral extraction. The sugarcane bagasse ash-based geopolymer concrete mixtures were also found to be cost and embodied energy-effective as compared to traditional concrete.



URL: https://www.tandfonline.com/doi/abs/10.1080/19648189.2023.2219709