







Review

Palm Oil Fuel Ash-Based Eco-Friendly Concrete Composite: A Critical Review of the Long-Term Properties

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Abstract: Rapid global infrastructural developments and advanced material science, amongst other factors, have escalated the demand for concrete. Cement, which is an integral part of concrete, binds the various individual solid materials to form a cohesive mass. Its production to a large extent emits many tons of greenhouse gases, with nearly 10% of global carbon (IV) oxide (CO₂) emanating from cement production. This, coupled with an increase in the advocacy for environmental sustainability, has led to the development of various innovative solutions and supplementary cementitious materials. These aims to substantially reduce the overall volume of cement required in concrete and to meet the consistently increasing demand for concrete, which is projected to increase as a result of rapid construction and infrastructural development trends. Palm oil fuel ash (POFA), an industrial byproduct that is a result of the incineration of palm oil wastes due to electrical generation in power plants has unique properties, as it is a very reactive materials with robust pozzolanic tendencies, and which exhibits adequate micro-filling capabilities. In this study, a review on the material sources, affecting factors, and durability characteristics of POFA are carefully appraised. Moreover, in this study, a review of correlated literature with a broad spectrum of insights into the likely utilization of POFA-based eco-friendly concrete composites as a green material for the present construction of modern buildings is presented.

Keywords: palm oil fuel ash; long-term properties; geopolymer concrete; durability

1. Introduction

Global warming, climate change, and more recently the concept of environmental sustainability have been major concerns as their adverse effects cannot be over-emphasized [1]. The introduction and incessant accumulation of harmful waste materials into the environment, along with certain industrial processes, which emit excessive volumes of greenhouse