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Review on performance of self compacting concrete containing solid waste and bibliometric properties: A review

Hanis Nadiah Ruslan [a], Khairunisa Muthusamy [a,*], Fadzil Mat Yahaya [a], Muhammad Ashraf Fauzi [a], Mohamed A. Ismail [b], Zuraina Ali [c]

[a] Faculty of Civil Engineering Technology, Universiti Malaysia Pahang Al-Sultan Abdullah, Lebuh Persiaran Tun Khalil Yaakob, 26300, Kuantan, Malaysia
[b] Department of Civil and Environmental Engineering, Brunel University London, London, UB8 3PH, UK
[c] Centre for Modern Languages, Universiti Malaysia Pahang Al-Sultan Abdullah, Lebuh Persiaran Tun Khalil Yaakob, 26000, Pekan, Malaysia

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ABSTRACT

Self-compacting concrete (SCC) is currently an intriguing product due to its ability to reduce labour work and time. Simultaneously, the growing global population and economy result in increased solid waste accumulation in landfills. In addition to occupying a substantial portion of landfill space, the disposal of solid waste also presents widely recognized health and environmental risks to nearby areas. To address these issues, utilizing solid waste as a substitute for cement has been explored as a potential solution. Various types of solid waste, including glass, ceramic, clay brick, banana leaf ash, palm oil fuel ash (POFA), eggshell, and rice husk ash (RHA) have been studied by researchers as cement replacements in SCC. This review aims to explain the impact of using solid waste as cement replacement in SCC on both its fresh and mechanical properties. The findings of this paper review suggest that replacing 10% of POFA, 20% of RHA, 10–15% of glass, 15% of eggshell, 10% of ceramic, and 5% of clay brick for cement results in improved fresh properties and strength of SCC. The optimum percentage of substitution and its impact on the mechanical properties of SCC is determined by the unique characteristics of the waste material being used. In summary, it is deemed acceptable to utilize solid waste as a substitute for cement in SCC to enhance the fresh properties and address environmental concerns.

1. Introduction

Throughout the years, Self-Compacting Concrete (SCC) has been widely recognized as the most advanced and innovative development in the field of concrete technology [1]. SCC is a unique type of concrete represents an upgraded version of traditional concrete that can be placed and consolidated without any vibration assistance due to its exceptional deformability, while remaining cohesive enough to be handled without any issues with segregation or bleeding [2–6]. SCC construction takes less time to complete, more environmentally friendly, noise-free environment, lowered labour expenses and enhanced compaction in structures that contain high quantities of reinforcement bars (rebars) [7–10]. To be considered successful, SCC must meet several essential criteria, such as high filling and passing ability, strong anti-segregation ability, good volume stability, and durability with the required mechanical properties [11,12]. The most important characteristics of SCC are its properties in a fresh state [13].

* Corresponding author.
E-mail address: khairunisa@umpsa.edu.my (K. Muthusamy).

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