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Sustainable And Eco-Friendly Infrastructure Featuring Self-Heal Concrete with Sodium Silicate

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Abstract

As the main building material, concrete brings with it certain problems like wear and tear and cracks. To address these issues, self-healing concrete (SHCr) has emerged as a promising solution. This paper aims at presenting a literature review on SHCr, with a specific focus on sodium silicate (SS) as the healing agent. SS, also referred to as water glass, exhibits significant promise in starting chemical reactions within the concrete matrix that result in self-healing phenomena. The integrated system of SHCr to repair cracks by itself not only enhances its durability but also significantly reduces maintenance expenses, thereby making it a reassuringly cost-effective solution. The autogenous, biological, and capsule-based healing processes that result in this self-repair process include the following: The importance of developing SHCr relates to prolonged durability of concrete structures with reduced intervention. SHCr, based on SS, exhibits the potential to strengthen the durability and sustainability of constructed environments for various domains such as infrastructure construction, green buildings, and marine construction. This article demonstrates that material composition, environment, and structural geometry are the significant attributes affecting SHCr. As was previously mentioned, self-repair concrete does have certain drawbacks, such as a high initial cost that this research seeks to significantly lower. These restrictions can also be overcome by combining the efforts of academics, professionals in the infrastructure-construction sector, and legislators in a cross-disciplinary manner. Lastly, the goal of this paper is to add to the body of knowledge already available on SHCr by elucidating the ways in which SS can enhance the healing properties of concrete systems and promote sustainability.

Keywords: Innovative building materials, Maintenance cost, Self-healing concrete (SHCr), Sustainability, Sodium silicate (SS)