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Sustainable Self-Curing Concrete: A Review on the Synergistic Use of Euphorbia Cactus Gel and Polypropylene Fibres

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Abstract: *The demand for sustainable construction materials has driven research into self-curing concrete technologies that reduce external water usage while enhancing long-term durability. This review explores the potential of natural plant-based additives—particularly Euphorbia cactus extract—as internal curing agents due to their high mucilage and water-retention capacity. Euphorbia gel offers a bio-based alternative to chemical curing admixtures, supporting prolonged hydration and reducing shrinkage-related cracking, especially in arid and water-scarce regions. In parallel, the incorporation of synthetic polypropylene fibres is reviewed for their role in enhancing tensile strength, crack resistance, and ductility, creating a composite material that balances eco-friendliness with mechanical performance.*

This paper synthesizes findings from experimental and theoretical studies on the use of Euphorbia extract and polypropylene fibres in concrete, covering their effects on workability, strength development, shrinkage mitigation, microstructure refinement, and chemical durability. It highlights key trends, optimal dosage ranges, and observed synergistic effects in fibre-reinforced, bio-modified mixes. Challenges such as variability in plant-based materials and long-term durability concerns are also discussed. The review concludes by identifying research gaps and proposing directions for future studies focused on standardization, long-term performance, and the integration of other natural polymers for green concrete development

Keywords: Self-curing concrete, Euphorbia cactus extract, Polypropylene fibres, Sustainable construction, Internal curing agents

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