

Microbial Biotechnology Approaches to Monuments of Cultural Heritage (book)

Biocement: A novel approach in the restoration of construction materials

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Abstract

Concrete is the most commonly used construction material worldwide for the development of durable structures. Structural integrity and design of buildings have become increasingly important in construction engineering as well as assessment of mixed formulation including cement and aggregate (i.e. sand, slag and stone). Microcrack formation on concrete may result in increased degradation and porous concrete. Therefore, there is a need to preserve and maintain concrete structures due to its high associated cost of restoration. In addition, reducing the negative environmental impact due to high CO₂ emissions during cement production need to be considered as well. One key solution includes bio-based self-healing techniques. Research has focused on biomineralisation, a method of sealing microcracks using bacterial calcium carbonate deposits, via a common process of biocementation or microbiologically induced calcium carbonate precipitation (MICP). As such, these deposits possess promising micro-bonding and pore-filling macro-effects for potential application in the construction industry. In view of these novel state-of-the-art techniques, this chapter provides an overview of potential microbes, mode of action of the self-healing process, primary limitations for future techniques and potential applications in the construction industry.