

# **Applications of Biomineralization in Geotechnical and Geo- Environmental Engineering**

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Over the last decades significant progress has been made developing applications of biomineralization in geotechnical and environmental engineering. Biochemical conversions can be used to improve the physical properties and sustainability performance of materials and processes used in constructions and subsurface applications. For example, biologically induced mineral precipitation can be used to increase the strength and stiffness of porous materials, mitigating liquefaction and erosion or improving bearing capacity of foundations and stability of slopes and excavations in granular soils. At the same time, these minerals can be used to fill up pores and fractures and create (reactive) hydrological barriers to control migration of contaminants, prevent leakage during CO<sub>2</sub> sequestration or improve the durability of ageing construction materials. Although many recent developments involve microbially induced precipitation of calcium carbonate, other biominerals, as well as biofilms and biologically produced gas, can be used to alter material behaviour in engineering applications. This contribution provides an overview on recent advances, including experimental studies at various scales, using either specific micro-organisms or enrichment of indigenous microbial communities, theoretical and numerical studies aimed to improve fundamental insight on the biogeochemical conversions and coupled to the hydro-mechanical properties. Besides the scientific and technological advances, also market potential, sustainability performance and other factors, which determine the successful implementation of these new bio-based technologies are discussed.