CERIS: Civil Engineering Research and Innovation for Sustainability

Design and development of monitoring tools for soil improvement using biocementation

Summary

The biological treatment of soils consists in using biological agents, such as bacteria, to produce calcium carbonate (biocement). This mineral bonds the grains and therefore improves the hydro-mechanical properties of the soil (permeability, stiffness and strength). This green technique has huge potential, but the applications at large scale are scarce.

The main purpose of this research is to develop a biosensor for in situ monitoring, as well as tools to predict the properties of the treated material. The biosensors will be tested in samples prepared at laboratory simulating field applications, using different protocols.

Standard laboratory tests will be performed to determine the hydro-mechanical properties of the treated material. Data found will allow relating biological activity detected by the biosensors with the amount of biocement and the improvements observed on the treated sand. The biosensor and these relationships will be useful tools to geotechnical design of this novel soil improvement technique.

Keywords

Biocementation, soil Improvement, sensors, monitoring tools.
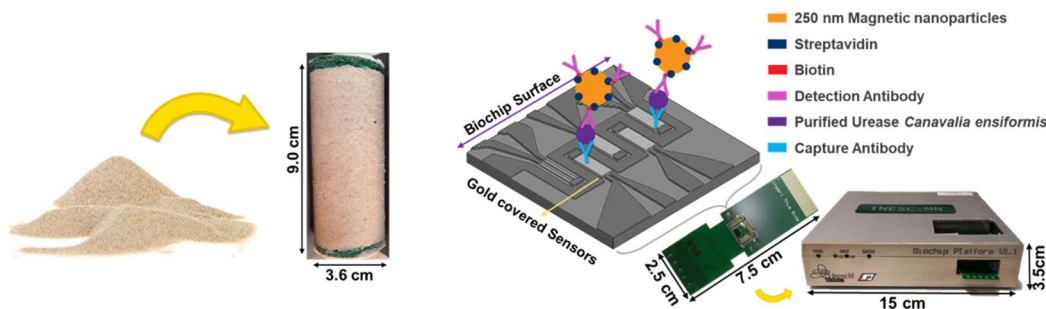
Cylindric biocemented sand sample (before and after treatment) (left) and scheme of sandwich ELISA detection method; biochip sensor mounted on a green printed circuit board and platform (right).

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