

Use of Biosensors for Assessing Soil Stabilization with MICP—A Review



M. S. Varnitha, Bharathi Ganesh, Sureka Naagesh, B. V. Manjunatha,
and H. N. Ramesh

Abstract Soil stabilization is a process of mixing of the parent soil with other soil, cement, lime, bituminous products, and silicates to improve shear strength and swell shrink behavior of the native soil. Bio-enzymes used for chemical soil stabilization are chemical, organic, and liquid concentrated substances. Microbially induced calcium carbonate precipitation (MICP) consists of producing calcium carbonate by hydrolyzing urea carried out by several microorganisms. Naturally, the deposition of CaCO_3 in the void spaces leads to clogging of voids in the material. Hence, MICP treatment is becoming more popular, safe, and sustainable method in the field of soil stabilization and also for rehabilitation of historical monuments, ancient masonry, and concrete structures. Hence, monitoring the biological process is essential as it strongly depends on environmental conditions and dosages of both bacteria and food present. A urease quantification using magnetic biosensor is an emerging efficient tool for this purpose. This review presents the effectiveness of the microbially induced calcium precipitation (MICP) as a stabilization method. Literature on laboratory studies on plant-derived urease induced carbonate precipitation is scanty. There

M. S. Varnitha (✉)
Nitte Meenakshi Institute of Technology, Bengaluru, India
e-mail: varnitha.ms@gmail.com

B. Ganesh
Nitte Meenakshi Institute of Technology, Bengaluru, India
e-mail: bharathi.ganesh@nmit.ac.in

S. Naagesh
BMSCE, Bengaluru, India
e-mail: rs.civ@bmsce.ac.in

B. V. Manjunatha
Department of Civil Engineering, DSCE, Bengaluru, India
e-mail: manjunathmbv@gmail.com

H. N. Ramesh
UVCE, Bangalore University, Bengaluru, India
e-mail: rheddur@yahoo.com

M. S. Varnitha
KSSEM, Bengaluru, India