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## The Strengthening and Cementation of Soils

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### Background

A variety of techniques are employed in geotechnical engineering practice to improve the in situ properties of soils. Different techniques are applicable to different types of soil. The technology of using microbially induced carbonate precipitation (MICP) as a means of improving the properties of sandy soil has attracted a significant amount of interest among civil/geotechnical engineers over the past decade. These MICP techniques have presented hurdles to large scale adoption, including being unable to penetrate fine sand and silt soils and causing the phenomenon of bio-plugging.

### Invention Description

Researchers at Arizona State University have invented a promising technology that uses agriculturally-derived urease to induce carbonate precipitation in soils. Improved features of this technology include inducement of carbonate precipitation in finer grained soils than possible with MICP, including fine sand and silt soils. Additionally, the new technology allows for columns of soil to be improved by carbonate precipitation rather than cementation of the entire soil mass.

### Potential Applications

- Civil Engineering
- Offshore Construction
- Mining
- Erosion Control
- Dust Prevention

### Benefits and Advantages

- **Improvement in granular soils.** Increase the strength of foundations in sands and silts.
- **Cost-effective.** Save costs on pumping and injection equipment, site setup, cleanup and labors.
- **Multiple usages of grouting.** Non-disruptive alternative to chemical grouting, micro-fine cement grouting, compaction grouting and deep soil mixing
- **Environment Friendly.** Facilitate removal of harmful by-products that can reverse the precipitation reaction.