



ME Seminar



Microstructural and Mechanical Characterization of MICP Treated Lunar Soil Simulant

Deeksha Porwal, IoE-IISc Postdoctoral Fellow, ME@IISc

ABSTRACT

Microbial Induced Calcite Precipitation (MICP) process effectively utilized in-situ resource utilization (ISRU) technique for consolidating lunar soil simulant (LSS) in the form of 'space brick'. A urease-producing *Sporosarcina pasteurii* bacterial strain was used to initiate the MICP process. A casting procedure was developed to make different shapes of the brick using a pre-machined Aluminium mold. A mixture of guar gum and NiCl_2 was added during the MICP process to enhance the mechanical properties of bricks. The flexural strength of brick was measured using a three-point bending test that increased from 2.8 MPa to 4.1 MPa with 10mM NiCl_2 and 1% guar gum supplementation. Bacteria precipitated calcium carbonate microstructure was observed using a transmission electron microscope (TEM). The energy dispersive X-ray (EDX) facility attached with TEM was used to analyze elements present in mineral precipitation. The X-ray diffraction (XRD) technique was used for phase analysis of bio-consolidated brick. Focused-ion-beam (FIB) milling combined with a scanning electron microscope (SEM) was used to see the internal structure of bio-consolidated brick and the bonding of soil particles with precipitated mineral formation via bacteria. These studies provided the in-depth understanding of microstructure behaviour and reveals the internal structure of the bacteria precipitated calcium carbonate and soil particles bonding.

ABOUT THE SPEAKER

Dr. Deeksha Porwal joined IISc Bangalore in July 2021 as an Institute of Eminence post-doctoral research fellow. She is working with Prof. Alope Kumar in the Department of Mechanical Engineering. Dr. Deeksha received her Ph.D. degree from the Department of Mechanical Engineering, NIT Durgapur in 2019. Her Ph.D. work involves the development of combined nanoindentation and finite element (FE) model to evaluate the elastoplastic properties of solids. She completed her M. Tech in Manufacturing Science Technology and B. Tech in Mechanical Engineering. Her research interest focuses on thin film deposition, material characterization, nanoindentation, and finite element modeling.



July 15, 2022, 4:00 pm, A R Auditorium, ME@IISc