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Topic of Master's Thesis / Bachelor's Thesis / Hiwi Job for

# Experimental and/or numerical investigations on microbially induced calcite precipitation and biofilm in microfluidic porous media

In this Master's Thesis / Bachelor's Thesis / Hiwi Job, microbiolly induced calcium carbonate precipitation (MICP) in porous media is to be investigated experimentally by carrying out microfluidic experiments.
MICP is an engineering technology that has recently gained attention for different engineering applications, among which is the targeted sealing of leakage pathways, the solidification and stabilization of soil, and the replacement of energy-intensive portland cement by bio cement in building materials. The precipitation of calcium carbonate is based on the hydrolysis of urea catalyzed by the enzyme urease. The major aim of the research is to determine and quantify pore-scale mechanisms that affect the relationship between porosity reduction (due to precipitates) and corresponding permeability reduction.
Additionally, some bacteria types can change the permeability of porous media by forming biofilm, a slimy layer of bacteria and extracellular polymeric substances. The investigation of such processes in porous media can be performed in microfluidic cells.
**The main tasks will be assisting in:**

- Manufacturing microfluidic cells made of Polydimethylsiloxane (PDMS)
- Developing suitable injection strategies for the implementation of microfluidic experiments for MICP.
- Development of suitable work steps for the implementation of microfluidic experiments for biofilm.
- Cultivation of bactaria
- Evaluation of the data with the software MATLAB.

The Master's Thesis / Bachelor's Thesis shall be summarized in a report and presented in an oral presentation.

**Examiner(s)**: apl. Prof. Dr.-Ing. Holger Class
**Supervisor(s)**: Kerem Bozkurt, Felix Weinhardt

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