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February 2, 2016

Topic of Your Thesis

for Your Name

Student ID number: Your Student ID

Investigating the influence of porosity-permeability relations for predicting microbially induced calcite precipitation

In Your Thesis, for the existing model for microbially induced calcite precipitation (MICP) [1] various porosity-permeability relations are to be investigated.

Mircobially induced calcite precipitation has been proven as a technology to seal leakage pathways [2]. For the modeling of such leakage mitigation efforts, it is important to predict the correct reduction of permeability.

Obviously, the structure of the initial porous medium and the conditions under which the MICP occurs, influence the reduction of permeability due to a reduction in porosity. Thus, the student is expected to investigate various scenarios consisting of combinations of injection strategies, porous media, and porosity-permeability relations. From comparisons to experimental data and between the different scenarios, suitable porosity-permeability relations are to be identified for each type of porous media.

The main tasks will be:

- Implement various porosity-permeability relations into the existing model for MICP [1];
- Evaluate the performance of the investigated relations for e.g. different porous media and injection strategies;
- Identify suitable relations for different porous media (e.g. sand or sandstone) and potential dependencies of the porosity-permeability relation on the injection strategy.

The findings shall be summarized in a report and presented in an oral presentation.

Examiner(s): Holger Class, Rainer Helmig
Supervisor(s): Johannes Hommel

Date of issue: 1.2.2016 or later
Date of submission: start date + 6 months

References

[1] Johannes Hommel, Ellen G. Lauchnor, Adrienne J. Phillips, Robin Gerlach, Alfred B. Cunningham, Rainer Helmig, Anozie Ebigbo, and Holger Class. A revised model for microbially induced calcite precipitation: Improvements and new insights based on recent experiments. *Water Resources Research*, 51(5):3695–3715, May 2015.

[2] Adrienne J. Phillips, Ellen G. Lauchnor, Joachim Joe Eldring, Richard Esposito, Andrew C. Mitchell, Robin Gerlach, Alfred B. Cunningham, and Lee H. Spangler. Potential CO_2 leakage reduction through biofilm-induced calcium carbonate precipitation. *Environmental Science & Technology*, 47:142–149, August 2013.