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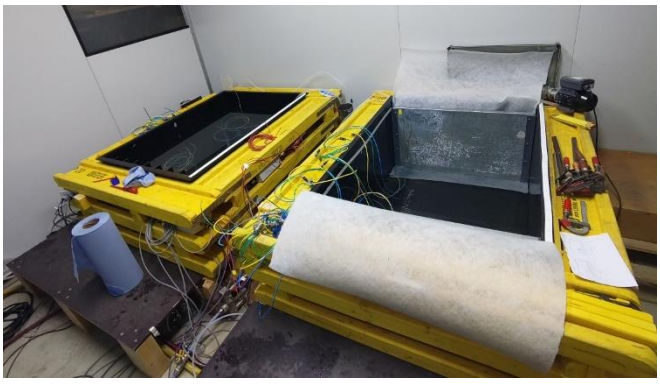
Problem Description
M.Sc. Thesis

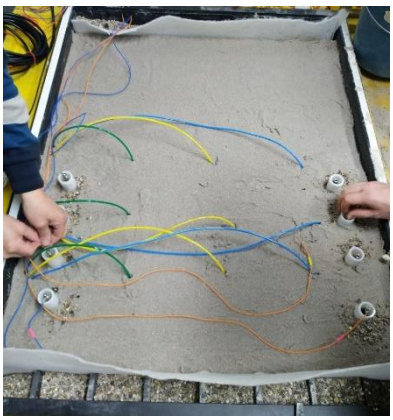
MA_WP2_AerobicTCEdegradingElectrolysis.docx

November 21, 2023
Simon Kleinknecht

Experimental Investigation of Bioaugmentation and Electrokinetic Transport of aerobic TCE-degrading bacteria in Porous Media

The master thesis is part of the EU project EiCLaR. The aim of the project is the advancement of scientific as well as technical innovations in the field of bioremediation. Bioaugmentation in combination with electrokinetic distribution represents a highly innovative and promising approach. The aim of this experiment is to investigate whether Trichlorethylene (TCE) degrading bacteria can be electrokinetically transported perpendicular to the groundwater flow direction by applying a direct current (DC). Two identical boxes (LxWxH 110x80x50 cm) were filled with a porous medium and inoculated with bacteria. A constant water flow of TCE-contaminated tap water is applied. A DC field is applied to one of the boxes while the second one serves as a reference without DC. The research question will be assessed by monitoring physico-chemical and biological data at the inflow, outflow, and within the boxes on a weekly basis. The experiment has already been running for several months supervised by master students and the project team. The experiment is operated in close collaboration with our project partners at TZW (German Water Centre) in Karlsruhe.





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Main tasks:

- Maintain the successful operation of the experiment by implementing appropriate monitoring measures.
- Perform weekly sampling campaigns of physico-chemical and biological parameters according to the sampling plan. This task may be delegated to student assistants.
- Modify the experimental setup as required, in close collaboration with the project team. Tasks may be delegated to our workshop and student assistants.
- Conduct a tracer test with Uranine and evaluate results to characterize the porous medium and flow regime of the experiment. This includes preparation of the measurement system and planning of the injection.
- Set up a flow model of the experiment using GMS:MODFLOW.
- Evaluate the sampled data according to the research question throughout the period of the thesis for intermediate discussions and at the end of the thesis.
- Conduct a literature review of the efficiency of aerobic TCE-degrading bacteria and the influence of electrolysis.

The problem, the approach and the results are to be presented in a concise manner in a research thesis and the results are to be defended in a presentation of approximately 30 minutes duration.

The experiment is conducted in the VEGAS facility. Lab staff, technical personal, and student workers are available to assist during the experiments. The thesis can be started immediately.

Supervision:

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