

Project work

Theme:

Exploring the selenium reduction capacity under controlled anaerobic biological conditions

Task:

In the current project, anaerobic sludge inoculum will be obtained from the denitrification chamber of wastewater treatment plant, prepared for experimental use and examined for its selenium (Se) reduction potential under controlled anaerobic conditions. Prior to Se bioreduction experiments, the sludge will be characterized for microbial activity and Se content. Batch experiments will be designed to investigate the reduction of selenate and selenite to elemental Se⁰. The parameters such as sludge dosage and initial Se(IV, VI) concentration will be systematically varied to optimize reduction efficiency. Analytical techniques including atomic absorption spectrophotometry (AAS) or ion chromatography (IC) will be employed to monitor the Se concentration after regular time interval in aqueous and solid phases. Moreover, total suspended solids (TSS), total volatile suspended solids (TVSS) and organic carbon fraction will also be analyzed to examine microbial activity. The kinetics and mechanisms of Se reduction by anaerobic sludge will be elucidated to provide insights into biotransformation pathways. The findings of current work will provide an understanding of the key parameters responsible for bioreduction of Se species under biologically controlled conditions.

Procedure:

- Literature review on bioreduction of selenium species
- Anaerobic sludge inoculum collection, preservation, analysis and preparation
- Maintenance of anaerobic conditions (e.g. pH control, media volume) in batch reactor bottles to ensure effective microbial activity
- Sample collection and analysis of residual Se, TSS, TVSS and organic carbon
- Results compilation and discussion
- Report writing and presentation

Literature for introduction:

Eswayah, A. S., Smith, T. J., & Gardiner, P. H. (2016). Microbial transformations of selenium species of relevance to bioremediation. Applied and environmental microbiology, 82(16), 4848-4859.

Issue date:

01.08.2025

Latest submission date (+6 Months):

30.11.2025

First examiner:

Univ.-Prof. Dr.-Ing. Mathias Ernst

Supervision:

Dr.-Ing. Muhammad Ali Inam

Scope of the study / project work

6 Leistungspunkte

12 Leistungspunkte