

Understanding the haloalkaline biodesulfurization process

Background:

Dihydrogen sulfide (H_2S) is a malodorous and highly toxic compound. An economical and ecofriendly method to remove H_2S from gas streams is biodesulfurization. This process makes use of haloalkaliphilic sulfur-oxidizing bacteria to convert dissolved sulfide to elemental sulfur. Subsequently, this bio-sulfur can be recovered and used as fertilizer or fungicide. However, the biological production of elemental sulfur is often accompanied by the production of undesired sulfur compounds, such as sulfate (SO_4^{2-}) and thiosulfate ($\text{S}_2\text{O}_3^{2-}$). Recent technological advancements in the biodesulfurization process have increased the sulfur selectivity from 90% to 96.6%. However less is known about the microbiological mechanisms involved in the changed line up. Biological sulfur oxidation is done by a cascade of enzymatic reactions, which have been well studied for different haloalkaliphilic bacteria. Activity tests with biomass from a pilot biodesulfurization plant have indicated fluctuations in the activity of the bacteria during operation of the plant. We hypothesize that these fluctuations correspond to changes in the metabolic activity of the microbes involved.

Aims:

The overall aim of the project is to understand the biochemistry of enhanced sulfur production and the microbial community involved. In the proposed study, we aim to quantify the gene expression of key enzymes involved in the biological oxidation of reduced sulfur compounds by using qPCR. Furthermore, we aim to study the specific activity of the enzymes under different reactor conditions.

Your Tasks:

1. Writing a thesis proposal/ literature review on enzymes involved in biological oxidation of sulfide, thiosulfate and sulfur under haloalkaline conditions and the methods available to quantify their expression.
2. Design and validation of PCR primers used to quantify gene expression
3. Quantify gene expression with qPCR
4. Performing specific activity assays for the selected enzymes
5. Data analysis and interpretation
6. Writing thesis

Your Profile:

- HBO/BSc/MSc student with a background in Biology, Microbiology or Biotechnology.
- English both written and spoken.
- Experience in Molecular Biology is a plus.

Important details:

- The duration of the project will be 6 months or more starting from March 2020.
- The research work will be conducted at [Wetsus](https://www.wetsus.nl), Center of Excellence of Water Research, located in Leeuwarden, the Netherlands.
- Salary: 175 € per month.

Contact details:

For any questions and application please feel free to contact Suyash Gupta via email: suyash.gupta@wetsus.nl