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Biological removal of H_2S in the presence of thiols from sour gas streams

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Motivation

Removal of sulfur containing compounds from sour gas streams plays a crucial role in environmental protection by decreasing sulfur dioxide emissions into the atmosphere. Among all available desulfurization technologies, biological processes are the most sustainable technologies for hydrogen sulfide removal. Besides H2S, sour gas streams can contain volatile organic sulfur compounds, such as thiols. Both organic and inorganic sulfur compounds are toxic, characterized with the obnoxious smell and potential corrosive effects [1].

A recent pilot study showed that with the addition of anaerobic bioreactor sulfur selectivity increased and the process did not abrupt with thiols addition. The added anaerobic bioreactor enabled selective pressure for sulfide oxidizing bacteria which are able to oxidize sulfide more efficiently. However, further insight into the underlining processes is required to fully understand work of newly proposed line-up.

The biotechnological desulfurization process offers:

- H_2S removal and recovery as elemental sulfur
- Operation at atmospheric pressure and ambient temperature
- Environmentally friendly process
- Produced elemental sulfur can be used as a soil fertilizer, fungicide and for sulfuric acid production

Technological challenge

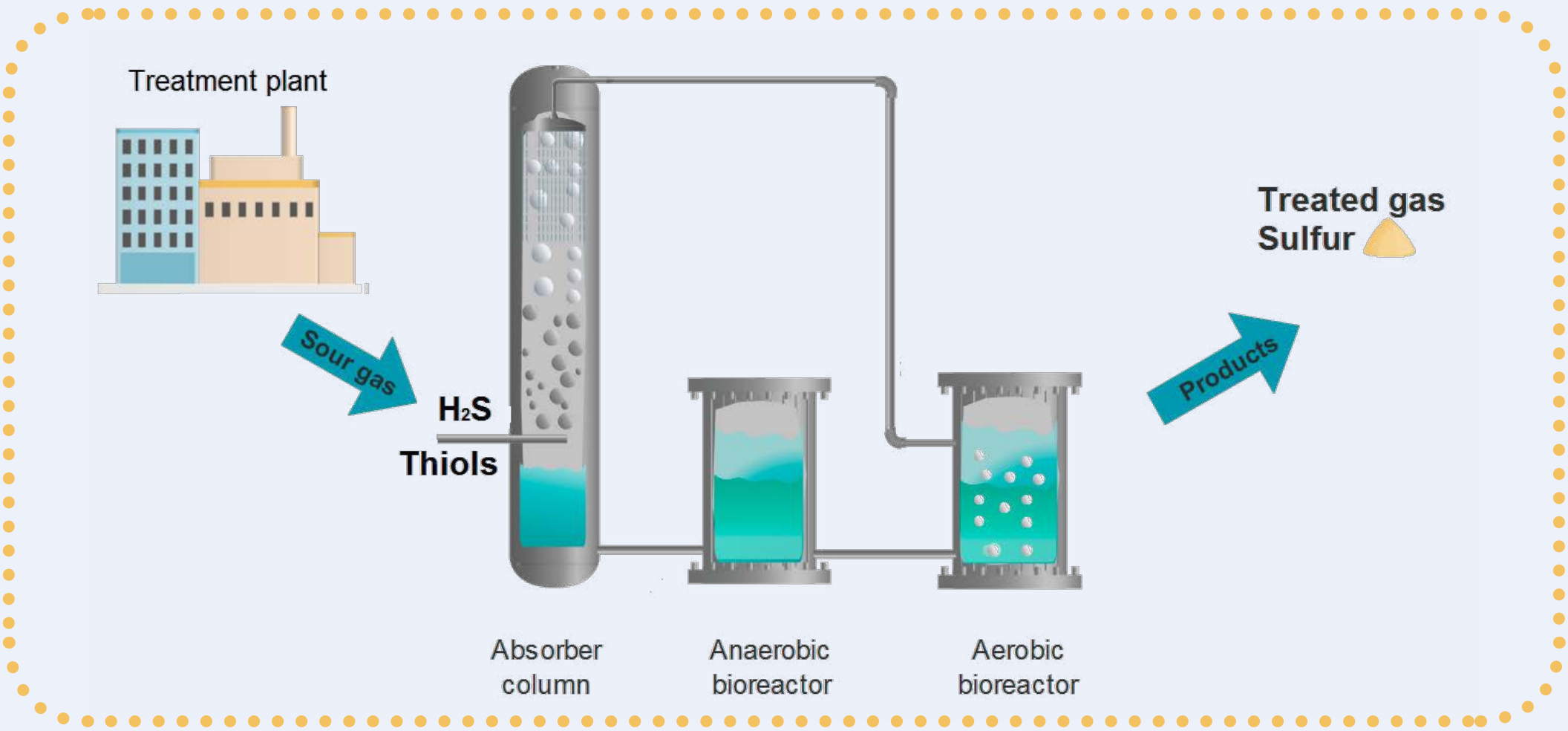
To investigate the newly proposed biodesulfurization line-up and the reactions that are taking place, with the emphasys on the microbial communities composition shifts in the presence of thiols.

With the addition of the anaerobic bioreactor we hypothesize to enhance bacterial growth and eliminate cell death, when high concentration of thiols is present in the system.

Research goals

To achieve our research goal the following questions are addressed:

- Line-up evaluation and underling processes.
- Effect of thiols on microbial activity and composition under halo-alkaline conditions.
- Identification of involved enzymes in oxygen-reducing mechanism during bacterial H_2S oxidation.
- Determination of optimal process conditions in sequential system, that enable safe and stable biodesulfurization technology.



Research graphical abstract with a newly proposed line-up for hydrogen sulfide removal in the presence of thiols

[1] Smet, E., Lens, P., & Van Langenhove, H. (1998). Treatment of waste gases contaminated with odorous sulfur compounds. Critical Reviews in Environmental Science and Technology, 28(1), 89–117

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 665874

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