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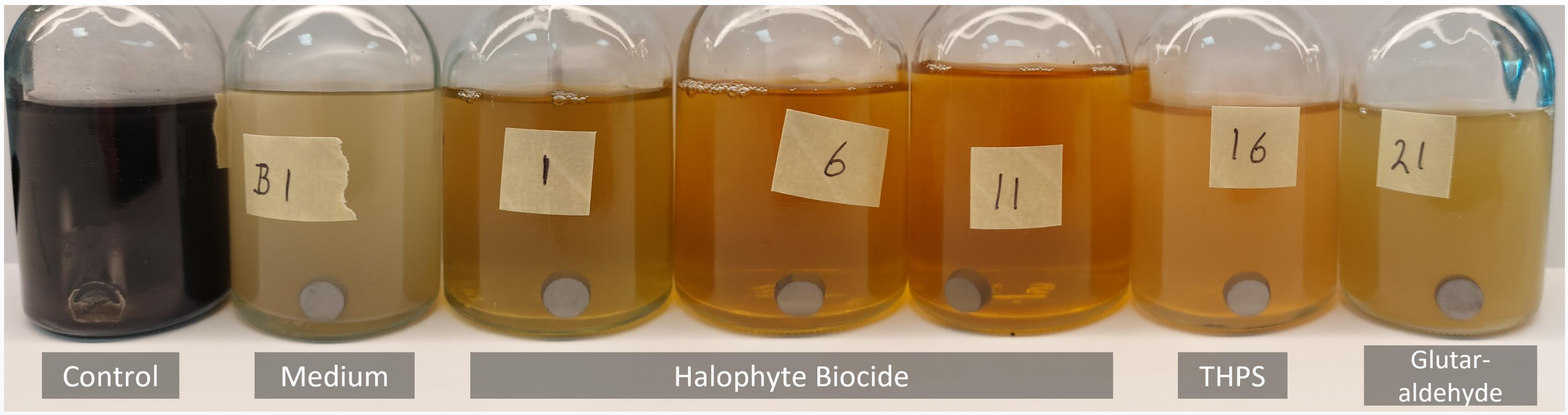


Halophyte Biocides

Halophytes are plants that tolerate or thrive while growing in saline environments. These environments include salt marshes, mangroves, salt flats, and intertidal zones like the Wadden Sea that span from Esbjerg in Denmark to the west Frisian Islands in The Netherlands.
Halophytes produce many bioactive chemicals, some of which exhibit biocidal properties. Through a proprietary biomass processing method, a biocide fraction can be produced from the halophytic biomass.

Experiment

Method

Anaerobic flasks were prepared with Postgate Medium with 32 g/L NaCl and inoculated with mixed microbial culture (MMCs) from sea sediment. Biocide was added to the flasks and incubated for 25 days at 20 °C. Two control conditions and five biocide conditions were examined.

Controls

- Blank (medium) – abiotic corrosion baseline
- Control – MIC baseline without any biocides

Halophyte Biocides

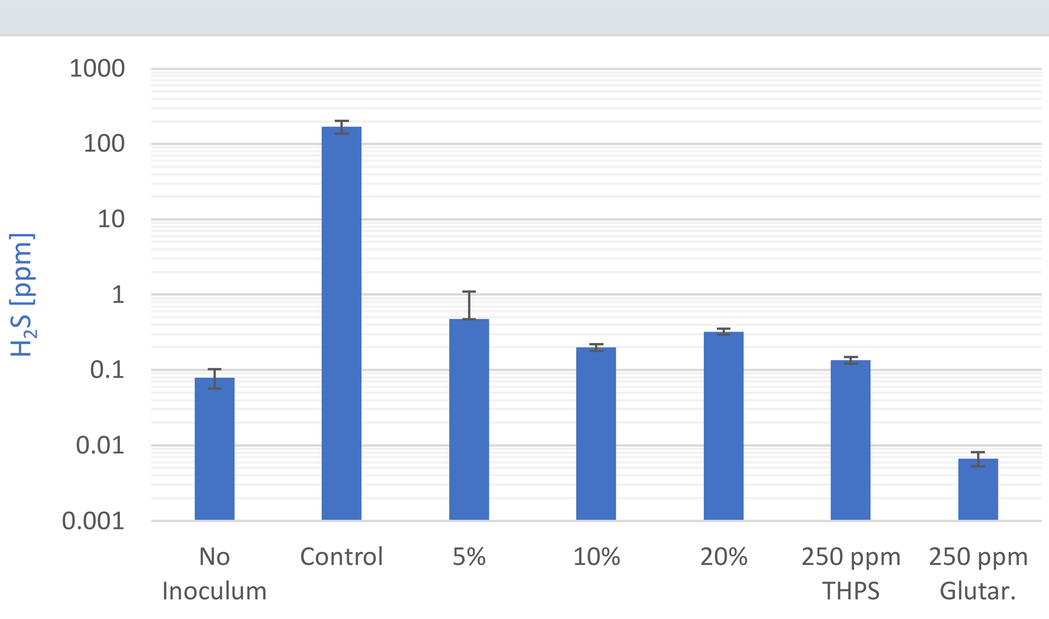
- 5% (v/v)
- 10% (v/v)
- 20% (v/v)

Conventional Biocides to benchmark against

- THPS: 250 ppm
- Glutaraldehyde: 250 ppm

H_2S Measurements

H_2S was measured at the end of the experiment after 25 days. The flasks had been sealed until this point, thus the accumulated H_2S production.



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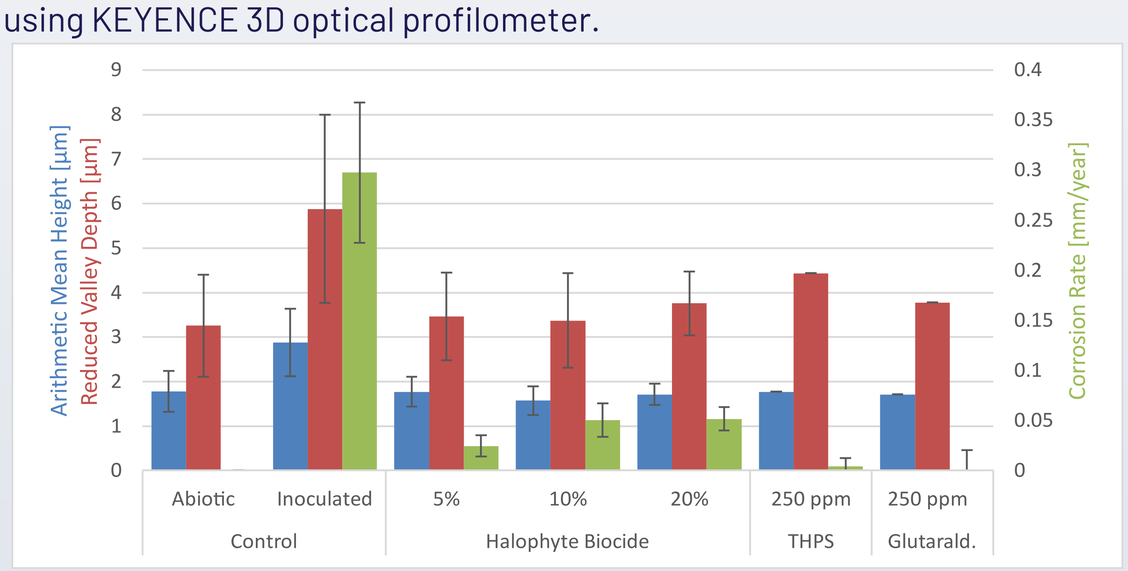
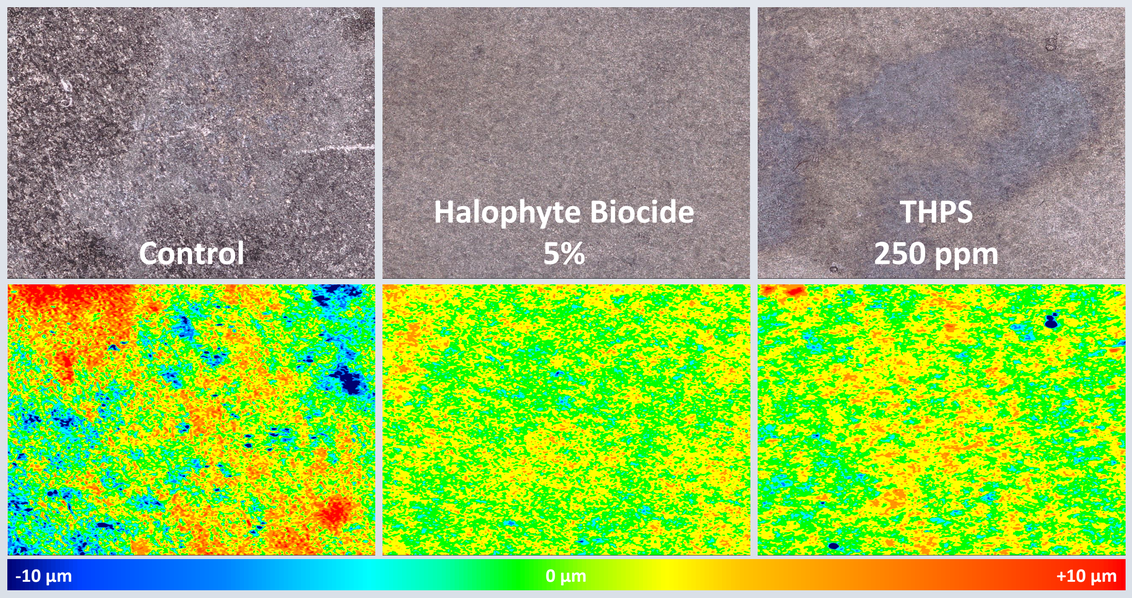
Conventional Biocides and MIC

The oil and gas industry uses biocides to prevent biofouling and Microbiologically Influenced Corrosion (MIC). Microorganisms in the seabed are injected into an oil reservoir with seawater during enhanced oil recovery. Without mitigative measures, these microorganisms can settle in biofilms inside the oil and gas pipelines. Sulfate-reducing bacteria, such as *Desulfovibrio,* are often found inside these biofilms, and through their metabolism, sulfate from the seawater is reduced using electrons from the iron in the pipeline's steel. MIC is often characterized by localized pitting corrosion. However, other mechanisms may also cause pitting, so multiple lines of evidence are needed to diagnose MIC.

Coupon examinations

Coupon weight loss was measured, and surface topography was scanned using KEYENCE 3D optical profilometer.





Conclusion

A few preliminary conclusions can be drawn from this data.

- The H_2S reduction is significant for all biocides, reducing the H_2S production by at least two magnitudes. THPS performed similarly to halophyte biocides. H_2S measurements for Glutaraldehyde were below the baseline for the medium.
- Corrosion rate is reduced with all biocides. Conventional biocides reduce corrosion significantly more than halophyte biocides. However, surface topographies are similar.
- Microbiological analyses are needed to understand the effect of biocides on the MMCs

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