



 Mineralogical Society of Great Britain & Ireland 

Applied Mineralogy Group Open Geoscience Virtual Talk:
09th Dec 2021, 3:30pm (GMT)

Prof. Martin Smith
University of Brighton, UK

'Mineralogy and geomicrobiology of microbially influenced steel corrosion in-marine environments.'

[Zoom Meeting – Register in Advance \(link below\)](#)

Abstract. Accelerated low water corrosion (ALWC) is an aggressive form of microbially influenced steel corrosion which poses a major threat to marine infrastructure. Investigation of the mechanism of ALWC via spectroscopic techniques (FTIR, XPS) and metagenomics has now confirmed the full mechanism of ALWC at Shoreham Harbour, U.K. The corrosion products form a layered structure with iron sulfides at the steel surface and iron oxides and sulfates (green rust - $\text{FeII}_4\text{FeIII}_2(\text{OH})_{12}\text{SO}_4 \cdot y\text{H}_2\text{O}$) in contact with seawater. The iron sulfides are produced by the reaction of steel with H_2S produced by sulfate reducing bacteria. Sulfides are then oxidised through a series of sulfur oxidations states, including sulfite and thiosulfate, by sulfide oxidising bacteria, generating acidity at every stage. The *dsrAB* genes mediating sulfate reduction in the corrosion have been identified in 61 species of Proteobacteriaceae and Firmicutes, but these represent only 26% of the strains present with *dsrAB* activity, with the remainder being currently uncultured. This indicates a high level of functional redundancy in the process. Additional sulfur cycle related gene activity includes *sqr* and *soxY*, involved in sulphide oxidation. The process encompasses the whole of the bacterial sulphur cycle and can result in corrosion rates up to 5 times faster than normal electrochemical corrosion. Comparison with local bed sediment indicates the bacterial consortia involved are sourced from anoxic sediments a few 10's of cm below the surface. Work is now continuing as part of the EU-RDF SOCORRO: Seeking Out Corrosion project. Results from XPS and FTIR have identified common mineralogy and sulfur speciation at additional UK sites. Further work will test if the bacterial consortia involved are process specific, and identify geochemical markers within the water column for early diagnosis and prevention.

You are invited to a Zoom meeting.
When: Dec 9, 2021 03:30 PM London
Register in advance for this meeting:

<https://ukri.zoom.us/j/92021120210330PM>

After registering, you will receive a confirmation email containing information about joining the meeting.