

## Microbes accelerate pyrrhotite dissolution at circumneutral pH

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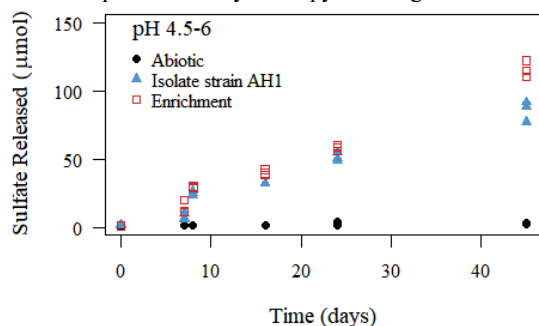
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The dissolution of sulfide minerals, particularly pyrite and pyrrhotite, results in the production of acidic waters high in dissolved metals and sulfate. While it is known that microorganisms accelerate the dissolution of sulfide minerals in extremely acidic systems, far less is known about their impact at near-neutral pH. Pyrrhotite ( $\text{Fe}_{1-x}\text{S}$ ,  $0 \leq x \leq 0.125$ ) is the 2<sup>nd</sup> most common iron sulfide in the earth's crust [1], and dissolves 10-100 times faster than pyrite under equivalent conditions [2]. Understanding its dissolution is critical to maintaining water quality in regions with active and historical mining.

Microbial communities substantially accelerate pyrrhotite dissolution under circumneutral conditions. Six strains of bacteria isolated from waste rock piles and humidity cells were used in batch experiments with a starting pH values of 4.5 and 6 with pyrrhotite as the only available electron donor. Measurements of aqueous sulfate, aqueous iron (II), and bulk magnetic susceptibility were used to measure the dissolution of pyrrhotite and the accumulation of secondary iron phases. The presence of surface-attached bacteria appears to alter the formation of passivation layers on pyrrhotite grains.



**Figure 1:** Sulfate release versus time for an abiotic control, an isolate, and an enrichment community at starting pH 4.5.

[1] Belzile *et al.* (2004) *J. Geochemical Explor.* **84**, 65–76.

[2] Nicholson & Scharer (1994) *Environ. Geochemistry Sulfide Oxid.* 14–30.