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Anaerobic oxidation of sulfides by reactive halogens under the simulative martian conditions

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The modern Mars may have subsurface liquid water on its subsurface, where possible life may survive. However, progressive water-rock interaction could tend to deplete oxidants in the subsurface, limiting the availability of some redox-sensitive nutrients. Here, we conducted experiments to simulate the dissolution sulfides by reactive halogens under low-temperature and anoxic conditions relevant with the martian surface. Our results show effective oxidation of pyrite by chlorates even under low-temperature conditions. We also observed the release of some concurrent transition metals in the pyrite. Based on the measured reaction rates, we further developed a weathering model to estimate the global significance of this process. Our findings may provide a predictive framework to understand the dynamic habitability of martian subsurface.