Contribution ID : **75** Type : **Oral**

Shining a light on Jarosite alteration and stability using synchrotron microdiffraction and imaging techniques.

Thursday, 22 November 2018 16:30 (15)

Jarosites and related minerals are of great importance to a range of mineral processing and research applications. They are used in the removal of iron species from smelting processes; they occur in metal bioleaching systems, and in the desulphurisation of coal; they are present in acid mine drainage environments.

There has been a recent resurgence in interest in jarosite and associated minerals since their detection on Mars by the MER rover Opportunity. In this context, the presence of jarosite has been recognised as a likely indicator of liquid water at the surface of Mars in the past and it is hoped that their study will provide insight into the environmental history of Mars.

Acid sulfate soils cover large areas of the Australian coastline and are likely to be a major constituent of the Martian environment. The oxidation of acid sulfate soils, coupled with potential release of heavy metals and acidic groundwaters, can have serious consequences for fragile ecosystems. Understanding these sediments will provide insight into the biogeochemical processes that affect the lifetimes of transient mineral species on Earth, and may be used to better understand soil acidification, contaminant mobility at sites affected by acid and metalliferous drainage, and even constrain past weathering and putative biosignatures on Mars.
Knowledge of the behaviour of jarosite minerals under the actual conditions that they are found in is crucial to understanding their potential environmental impacts on both Earth and Mars. To this end, we are engaged in a program to study the formation, stability and alteration of jarosite minerals using a complementary suite of *in situ* synchrotron and neutron techniques.
In this contribution we discuss the results of parallel neutron and X-ray imaging at OPAL and the Australian Synchrotron, combined with synchrotron microdiffraction to map the mineralogy and structural relationships within naturally occurring jarosite nodule handspecimens formed from hydrothermal alteration.

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Session Classification : Parallel Session 9

Track Classification : Earth and Environment