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Thermal Expansion of Monoclinic Natrojarosite: A Combined Time-of-Flight Neutron and Synchrotron Powder Diffraction Study.

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Jarosites and related minerals are of great interest to a range of mineral processing and research applications. In some settings jarosite formation is encouraged, In other environments jarosite formation can hinder the desired reaction. Jarosites are a major component of acidic soils and are present in significant amounts in acid mine drainage environments. There has been a recent resurgence in interest in jarosite minerals since their detection on Mars. In this context, the presence of jarosite has been recognised as a likely indicator of the presence of water on Mars in the past. It is hoped that study of their formation mechanisms, stability and thermoelastic properties will provide insight into the environmental history of Mars as well as informing terrestrial industrial concerns. To this end we are engaged in a program to study jarosites and their formation and stability behaviour over a range of conditions.
This contribution describes in situ powder diffraction experiments to determine the thermal expansion of a deuterated natrojarosite. Data were collected on the HRPD beamline at the ISIS spallation source where the natrojarosite sample was heated from 10–700K, and at the powder diffraction beamline at the Australian synchrotron where the sample was heated from 80-700K.
Thermal expansion coefficients have been fitted from 10-470K and show that there is most variation normal to the layers of sulphate tetrahedra and iron octahedra within the jarosite structure and contains more flexible hydrogen bond linkages. Details of the combined neutron-synchrotron data analysis approach will be discussed.

Keywords or phrases (comma separated)

Earth Sciences, Jarosite, Mars, Synchrotron, Neutron, Diffraction, in situ

Summary

Primary author(s) : Dr BRAND, Helen (Australian Synchrotron.)

Co-author(s) : Dr GREY, Ian E. (CSIRO Mineral Resources Flagship); Dr KNIGHT, Kevin S. (ISIS neutron source); Ms SCARLETT, Nicola V. Y. (CSIRO Mineral Resources Flagship)

Presenter(s) : Dr BRAND, Helen (Australian Synchrotron.)

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