

WHAT LURKS IN THE MARTIAN ROCKS AND SOIL? INVESTIGATIONS OF SULFATES, PHOSPHATES, AND PERCHLORATES

Looking for jarosite on Mars: The low-temperature crystal structure of jarosite†

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ABSTRACT

Single-crystal diffraction of jarosite, $\text{KFe}_3^{3+}(\text{SO}_4)_2(\text{OH})_6$, has been undertaken at low temperatures that proxy for martian surface conditions. Room-temperature data are consistent with literature data [$a = 7.2913(5)$, $c = 17.1744(17)$, and $V = 790.72(11)$ in $R\bar{3}m$], while the first low-temperature data for the mineral is presented (at 253, 213, 173, and 133 K). Data collections between 297 and 133 K show strongly anisotropic thermal expansion, with the **c** axis much more expandable than the **a** axis. Much of the anisotropy is due to strong distortion of the KO_{12} polyhedron, which increases by 8% between 297 and 133 K. The data sets can aid in the identification of jarosite by X-ray diffraction of martian soils using the Curiosity Rover's CheMin instrument.

Keywords: Crystal structure, low temperature, jarosite, Mars, anisotropy, alunite supergroup