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**REVIEW ARTICLE**

# The crystal structure and vibrational spectroscopy of jarosite and alunite minerals

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## ABSTRACT

The alunite supergroup of minerals is a large hydroxy-sulfate mineral group, which has seen renewed interest following their discovery on Mars. Numerous reviews exist concerning nomenclature, formation, and natural occurrence of this mineral group. Sulfate minerals in general are widely studied and their vibrational spectra are well characterized. However, no specific review concerning alunite and jarosite spectroscopy and crystal structure has been forthcoming. This review focuses on the controversial aspects of the crystal structure and vibrational spectroscopy of jarosite and alunite minerals. Inconsistencies regarding band assignments especially in the 1000–400 $cm^{-1}$ region plague these two mineral groups and result in different band assignments among the various spectroscopic studies. There are significant crystallographic and magnetic structure ambiguities with regards to ammonium and hydronium end-members, namely, the geometry these two ions assume in the structure and the fact that hydronium jarosite is a spin glass. It was also found that the synthetic causes for the super cell in plumbojarosite, minamiite, huangite, and walthierite are not known.

**Keywords:** Jarosite minerals, alunite minerals, vibrational spectroscopy, Raman spectroscopy, infrared spectroscopy, crystal structure, magnetic structure, super cell