

LETTER

**Terrestrial analogs of martian jarosites: Major, minor element systematics and Na-K zoning in selected samples**

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ABSTRACT

Natural jarosites selected for study have mixed domains of jarosite,  $\text{KFe}_3^{3+}(\text{SO}_4)_2(\text{OH})_6$ , and natrojarosite,  $\text{NaFe}_3^{3+}(\text{SO}_4)_2(\text{OH})_6$ . Minor elements include Al in the octahedral B-site, and P, As, Mo, and V in the tetrahedral T-site. High abundances of As are detected in some samples. Oscillatory zoning of Na and K in a subset of these samples has been explored using BSE images, X-ray maps, and a 1  $\mu\text{m}$  EDS beam. Our work shows that zoning is composed of less than micrometer-sized bands of near end-member compositions. This agrees with the XRD work of Desborough et al. (2006), where 32 natural hypogene and supergene jarosites were found to be mixtures of near end-member compositions and showed <5% solid solution. This indicates a wide solvus (miscibility gap) between jarosite and natrojarosite. It also suggests that special crystallization effects are active in solid-solution and aqueous-solution interactions. Here, the optimal conditions for the crystallization of end-member compositions are at low temperatures (<100 °C), and when the two end-members of a binary solid-solution series have different solubilities, as do jarosite and natrojarosite (Glynn 2000). These conditions are commonly found in supergene environments, and are best illustrated by spectacular oscillatory zoning of jarosite and natrojarosite in samples from the Apex Mine, Arizona and Gold Hill, Utah.

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