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LEAD IN JAROSITE: AN X-RAY ABSORPTION SPECTROSCOPY APPROACH

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ABSTRACT

Jarosite *s.s.* – ideally $KFe_3(OH)_6(SO_4)_2$ – is a secondary ferric sulphate formed in acidic environments with high potassium content, being not only environmentally important but also economically relevant within hydro-metallurgical routes and acid mine drainage (AMD) processes as it retains silver and lead. Jarosite belongs to the so-called alunite mineral group, having trigonal symmetry and general formula $AB_3(TO_4)_2(OH)_6$, where A represents a large cation with icosahedral coordination [K^+, Na^+, NH_4^+, H_3O^+, Ag^+, Tl^+, Pb^{2+}, Bi^{3+}, B stands for a smaller metal ion with octahedral coordination – Fe^{3+} (jarosite *s.s.*) or Al^{3+} (alunite *s.s.*), plus minor V^{3+}, Fe^{2+},Cu^{2+}, Zn^{2+}, Mg^{2+} – and T represents a tetrahedral cation [S^{6+}, As^{5+}, P^{5+}]. The incorporation of lead is limited and possibly restricted to nano-domains giving rise to the formula $(K_{1-x}Pb_y)Fe_3(OH)_6(SO_4)_2$, with $y << x$, despite the occurrence of a specific lead mineral (plumbojarosite) to which the same trigonal symmetry was attributed. However, lodging of the lone electron pair of Pb^{2+} ions raised a space group ambiguity (centred R $\bar{3}$ *m* versus non-centred R 3 *m*), once apparently it would be favourably accommodated within the atomic array of jarosite along the c-axis of a non centro-symmetric crystal structure. As a contribution to clarify this ambiguity, the results of a preliminary X-ray absorption spectroscopy study at the *L*-edge of lead in jarosite from the abandoned mine of S. Domingos (Portuguese sector of the Iberian Pyrite Belt) are presented and discussed.

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