DISCOVERY OF POTENTIAL NEW MINERAL SPECIES IN THE PEGMATITE OF VARUTRÄSK, SWEDEN

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The Varuträsk pegmatite, located near Skellefteå in northern Sweden, is a well-zoned and extremely differentiated pegmatite discovered in the early 20th century. This pegmatite has been intensively studied by Swedish mineralogists due to its great mineralogical diversity, particularly in phosphates, silicates, and oxides.

Recent investigations of phosphate assemblages from the Varuträsk pegmatite indicate significant chemical variations in minerals of the alluaudite group, with a simplified structural formula $A(2)'A(1)M(1)M(2)_2(TO_4)_3$. Varulite, $Na_2Mn_2Fe^{3+}(PO_4)_3$, was first described in Varuträsk, and shows a partial oxidation to alluaudite *s.s.* through the $^{A2}Na^{+} + {}^{M2}Fe^{2+} \rightarrow {}^{A2}\square + {}^{M2}Fe^{3+}$ substitution mechanism. Under higher oxygen fugacities, a progressive oxidation of alluaudite *s.s.* results in a potential new mineral species, characterized by the end-member formula $\square\square Mn^{3+}Fe^{3+}_2(PO_4)_3$, that can be obtained through the substitution mechanism $^{A1}Na^{+} + {}^{M1}Mn^{2+} \rightarrow {}^{A1}\square + {}^{M1}Mn^{3+}$. However, a further crystal structure characterization of this sample is necessary to confirm the occurrence of vacancies in the *A*(1) site.

On the surface of another varulite sample, tiny reddish grains occur, and their unit-cell parameters, a = 6.866(5), b = 13.178(8), c = 11.536(7) Å, β = 98.771(6)°, are relatively close to those of caryinite. This mineral is isostructural with alluaudite, and its crystal structure refinement was performed in space group *I2/a*. The structure consists in staggered chains of edge-sharing *M*(1) and *M*(2) octahedra, connected through TO_4 tetrahedra to form strongly-bonded layers perpendicular to the *b* crystallographic axis. The *A*(2)' and the *A*(1) sites are located in two distinct types of channels occurring between these layers, and running along the *a* axis. The empirical formula of that sample, obtained from an average of six electron-microprobe analyses, is $(Pb_{0.50}Na_{0.30}[]_{0.17}K_{0.03})(Ca_{0.54}Na_{0.46})(Ca_{0.64}Mn_{0.36})(Mn_{1.46}Mg_{0.52}Fe_{0.02})(AsO_4)_3$, in good agreement with the structural formula deduced from the assigned site populations by considering the multiplicity of each crystallographic sites. The predominancy of Pb in the *A*(2)' site indicates that this phase may correspond to a new Pb-rich caryinite species, and therefore, to a new end-member in the alluaudite-type arsenate group.