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Clinoholmquistite discredited: The new amphibole end-member fluoro-sodic-pedrizite

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ABSTRACT

Re-examination of holotype "clinoholmquistite", ideally $^{A}\square\,^{B}Li_2\,^{C}(Mg_3Al_2)\,^{T}Si_8\,O_{22}\,^{X}(OH)_2$ (Ginzburg 1965) from the Tastyg spodumene deposit, Tuva, Siberia, Russia by EMP and SIMS analysis and structure refinement shows that the sample consists of a mixture of two distinct amphibole compositions, tremolite and a new amphibole end-member, fluoro-sodic-pedrizite, ideally $^{A}Na\,^{B}Li_2\,^{C}(Mg_2Al_2Li)\,^{T}Si_8\,O_{22}\,^{X}F_2$ (IMA-CNMMN 2004-002). Fluoro-sodic-pedrizite from Tastyg has the following crystal-chemical formula and unit-cell parameters: $^{A}(Na_{0.64}K_{0.01})\,^{B}(Li_{1.93}Ca_{0.04}Na_{0.03})\,^{M1}(Mg_{1.69}Fe^{2+}_{0.31})\,^{M2}(Al_{1.98}Cr_{0.01}Zn_{0.01})\,^{M3}(Li_{0.64}Fe^{2+}_{0.21}Mg_{0.13}Mn_{0.02})\,^{T1}(Si_{3.96}Al_{0.04})\,^{T2}Si_4\,O_{22}\,^{X}(F_{1.10}OH_{0.90})$, a = 9.368(8), b = 17.616(10), and c = 5.271(4) Å, β = 102.38(4)°, V = 849.6 Å^3, Z = 2. The structure has been refined to R_{obs} = 2.3% ($I > 3\sigma_I$) and R_{all} = 3.8%. Refined site-scattering values and site-geometries were used, together with EMP and SIMS results, to obtain site populations. Fluoro-sodic-pedrizite is the first amphibole end-member with dominant ^{C}Li found in Fe-poor geologic environments. The coexisting tremolite contains only 0.002 wt% Li_2O and 0.06 wt% B_2O_3, probably ordered at the T1 site. Crystal-chemical arguments, as well as preliminary experimental work, suggest clinoholmquistite is unstable.