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Crystal structure and chemical composition of Li-, Fe-, and Mn-rich micas

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Abstract

The crystal chemistry of three Li-, Fe-, and Mn-rich trioctahedral micas has been characterized by single-crystal X-ray diffraction. The samples are from Hirukawa mine, Japan: $(Si_{3.43}Al_{0.57})(Al_{1.00}Fe_{0.38}Mg_{0.01}Mn_{0.17}Li_{1.44})(Na_{0.05}K_{0.95})O_{10}F_{1.88}(OH)_{0.12}$; from Mokrusha mine, Russia: $(Si_{3.30}Al_{0.70})(Al_{1.00}Fe_{0.36}Mg_{0.01}Mn_{0.31}Li_{1.32})(Ca_{0.01}Na_{0.04}K_{0.94})O_{10}F_{1.91}(OH)_{0.09}$; and from Sawtooth Mountains, Boise County, Idaho, U.S.A.: $(Si_{3.11}Al_{0.89})(Al_{0.91}Ti_{0.02}Fe_{0.46}Mg_{0.03}Mn_{0.52}Li_{1.06})(Na_{0.05}K_{0.92}Rb_{0.02})O_{10}F_{1.89}(OH)_{0.11}$. Our crystals belong to the 1*M* polytype with layer symmetry *C*121(1) and show M1 and M3 sites much larger in size than M2. Mean electron-count (m.e.c.) values are more variable for the M1 and M3 sites than for M2. With the exception of the sample from Sawtooth Mountains, all tetrahedral mean bond lengths appear to be smaller for T1 than for T11 site. When compared to the Li- and Fe-rich series, crystals show similar crystal-chemical trends, thus suggesting that the layer structure is affected in a similar way by Fe and Mn cations.

Keywords: Masutomilite, polylithionite, siderophyllite, pegmatite, crystal structure, crystal chemistry