

Scandian actinolite from Jordanów Śląski, Lower Silesia, Poland: Compositional evolution, crystal structure, and genetic implications

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ABSTRACT

Scandian actinolite evolving to scandio-winchite (up to 5.45 wt% Sc₂O₃) has been found in chlorite-dominant xenoliths incorporated into marginal portion of a granitic pegmatite. The pegmatite intruded a blackwall schist zone developed around rodingite-type rocks exposed in a serpentinite quarry at Jordanów Śląski near Sobótka, ~30 km south of Wrocław, Lower Silesia, Poland. The amphiboles form irregular overgrowths around cascandite and represent a complex solid-solution series among actinolite and scandio-winchite end-members, with a trace contribution of “scandio-magnesio-hornblende.” Structural studies of a scandian actinolite crystal with composition $A[\square_{0.995(2)}K_{0.005(2)}]_{\Sigma 1}B[Na_{0.24(5)}Ca_{1.73(4)}]_{\Sigma 1.98(1)}C[Mg_{3.74(7)}Fe^{2+}_{0.90(3)}Mn_{0.04(1)}Sc_{0.26(3)}Al_{0.05(1)}]_{\Sigma 4.99(1)}T[Si_{7.98(2)}Al_{0.02(2)}]_{\Sigma 8.00}O_{22}(OH)_2$ revealed monoclinic *C2/m* structure with unit-cell parameters $a = 9.8517(3)$, $b = 18.0881(6)$, $c = 5.28501(18)$ Å, $\beta = 104.809(4)^\circ$, in which scandium is located solely at the ^cM2 site. Scandian amphiboles are uncommon in geological environments, and invite comments on the origin of the observed Sc enrichment in the amphibole structure. Textural appearance of the chlorite-cascandite-amphibole clusters suggests that the formation of the amphiboles is related to the evolution of the country rocks followed by partial alteration of blackwall schist xenoliths by pegmatite-forming melt.

Keywords: Scandium, amphibole, scandian actinolite, scandio-winchite, composition, structure refinement, origin