

Crystal structure of a new (21)-clinopyribole synthesized at high temperature and pressure

HEXIONG YANG,* JÜRGEN KONZETT,† AND CHARLES T. PREWITT

Geophysical Laboratory, Carnegie Institution of Washington, 5251 Broad Branch Road, N.W., Washington, D.C. 20015-1305, U.S.A.

ABSTRACT

A (21)-clinopyribole with the composition $K_{1.10}Na_{2.32}Ca_{1.52}Mg_{5.85}Al_{1.23}Si_{12.04}O_{34}(OH)_2$ has been synthesized at 10 GPa and 1250 °C in a multi-anvil apparatus. The unit-cell parameters are $a = 9.8390(9)$, $b = 26.6471(6)$, $c = 5.2665(5)$ Å, $\beta = 106.25(5)^\circ$, and $V = 1325.6(4)$ Å³. The structure (space group *A2/m*) consists of an alternating arrangement of single- and double-chain silicate slabs along the *b* axis, with a + + + + configuration. This phase possesses all the features predicted by Veblen and Burnham (1978b) for a mixed-chain silicate intermediate between pyroxenes and amphiboles. The single-chain portion of the structure corresponds to a clinopyroxene with the omphacite composition $Di_{55}Jd_{45}$, whereas the double chain portion is essentially a potassic richterite. The MS2 cation in the single-chain portion occupies a coordination environment that is similar to the M4 site in richterite, whereas the MD4 cation coordination in the double-chain portion is comparable to the M2 site in *C2/c* omphacite. The observed unit-cell volume is 1.5% smaller than the equivalent mixture of $Di_{55}Jd_{45}$ + richterite, accounting, in part, for its high-pressure stability relative to its pyroxene and amphibole components.