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Ferri-clinoholmquistite, $Li_2(Fe^{2+},Mg)_3Fe^{3+}_2Si_8O_{22}(OH)_2$, a new ^{B}Li clinoamphibole from the Pedriza Massif, Sierra de Guadarrama, Spanish Central System

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Abstract

Ferri-clinoholmquistite is a new amphibole species from episyenites in the East Pedriza Massif (Central System, Spain), where it is associated to albite, augite-aegirine, titanite, andradite, magnetite, and apatite. It is black, vitreous, translucent, non-fluorescent, and brittle. It shows gray streak, H(Mohs) = 6, splintery fracture, perfect {110} cleavage, (001) parting, D_{meas} = 3.19, and D_{cal} = 3.25. Crystals are prismatic, elongated on [001]. In plane-polarized light, it is strongly pleochroic: X = yellow green, Y = indigo blue, Z = green blue, with absorption $X < Y \leq Z$; $Z = b$, $Y - c = 10(2)°$, $X - a \sim -2°$ (in β obtuse). Ferri-clinoholmquistite is biaxial positive, $\alpha = 1.699(2)$, $\beta = 1.703(2)$, $\gamma = 1.708(2)$, $2V_z$(meas) = 72(7), $2V_z$(calc) = 84(6), $r < v$. It is monoclinic, space group $C2/m$, $a = 9.472(4)$, $b = 17.844(6)$, $c = 5.276(6)$ Å, $\beta = 101.97(9)°$, $V = 872(1)$ Å^3, $Z = 2$. X-ray powder-diffraction pattern data were determined. Analysis by a combination of electron microprobe and flame photometry gives the following formula, calculated assuming OH + F = 2 and T sites fully occupied by Si: $^{A}(Na_{0.43}K_{0.03})^{B}(Li_{1.66}Na_{0.30}Ca_{0.04})^{C}(Fe^{3+}_{1.54}Fe^{2+}_{1.35}Mg_{1.21}Li_{0.49}Al_{0.20}Ti^{4+}_{0.12}Mn^{2+}_{0.07}Zn_{0.02})^{T}(Si_8)O_{22}(OH_{1.58}F_{0.42})$. From crystallographic refinements the M4 site is split, implying ordering of Li and Na, and within the A cavity, Na occupies the Am position.