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Jingwenite-(Y) from the Yushui Cu deposit, South China: The first occurrence of a V-HREE-bearing silicate mineral

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Abstract

Jingwenite-(Y), $Y_2Al_2V^{4+}_2(SiO_4)O_4(OH)_4$, the first V-HREE-bearing silicate mineral discovered in nature, is an abundant component of a sediment-hosted stratiform Cu (SSC) deposit, Yushui, South China. The mineral occurs in bedded/massive sulfide-bearing ore and is associated with bornite, chalcopyrite, galena, xenotime-(Y), nolanite, thortveitite, roscoelite, barite, and quartz. Optically, jingwenite-(Y) is biaxial (+), with $\alpha = 1.92(4)$, $\beta = 1.95(2)$, $\gamma = 1.99(3)$ (white light), and $2V$ (calculated) = 83°. The dispersion is medium with r < v, and the pleochroism is with X = light brown, Y = brown, Z = dark brown. The color, streak, luster, and hardness (Mohs) are light brown, yellowish gray, vitreous, and 4½–5, respectively.

Jingwenite-(Y) is monoclinic, with space group $I2/a$, $Z = 4$, and unit-cell parameters $a = 9.4821(2)$ Å, $b = 5.8781(1)$ Å, $c = 19.3987(4)$ Å, $\beta = 90.165(2)°$, and $V = 1081.21(4)$ Å^3. The structure of jingwenite-(Y) has chains of edge-sharing Al(V,Fe)-O octahedra and V(Ti)-O octahedra extending along the *b*-axis and linked by insular Si-O tetrahedra, leaving open channels occupied by HREEs. Jingwenite-(Y) is a new nesosilicate structural type.

Sm-Nd dating and Nd isotope signatures of jingwenite-(Y) reveal an epigenetic origin and suggest that HREEs and V were added to the SSC system via leaching of abundant heavy minerals in the footwall red sandstone by oxidized basinal brines. The abundance of jingwenite-(Y) at Yushui indicates that it could potentially be a valuable resource for HREE and V. Moreover, HREE and V mineralization can also occur in the same sediment-hosted Cu mineral system.

Keywords: New mineral, jingwenite-(Y), heavy rare earth elements, Yushui