

## Yuchuanite-(Y), $Y_2(CO_3)_3 \cdot H_2O$ , a new hydrous yttrium carbonate mineral from the Yushui Cu deposit, South China

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### ABSTRACT

A new mineral species, yuchuanite-(Y), ideally  $Y_2(CO_3)_3 \cdot H_2O$ , has been discovered and characterized in the Yushui Cu deposit in South China. The mineral occurs in bedded/massive ore and is associated with bornite, chalcopyrite, galena, sphalerite, bastnäsite-(Y), xenotime-(Y), anhydrite, and quartz. Individual crystals range in size from 30 to 300  $\mu\text{m}$ . No twinning is observed. The mineral is colorless and transparent with a vitreous luster. The calculated density is 3.62  $\text{g}/\text{cm}^3$ . An electron microprobe analysis yields the empirical formula (based on 10 O apfu),  $(Y_{1.61}Yb_{0.11}Er_{0.11}Dy_{0.08}Ho_{0.03}Gd_{0.02}Tm_{0.02})_{\Sigma 1.99}(CO_3)_3 \cdot H_2O$ .

Yuchuanite-(Y) is triclinic, with space group  $P\bar{1}$  (#2),  $Z = 6$ , and unit-cell parameters  $a = 6.2134(3)$  Å,  $b = 8.9697(3)$  Å,  $c = 19.9045(7)$  Å,  $\alpha = 91.062(3)^\circ$ ,  $\beta = 90.398(3)^\circ$ ,  $\gamma = 91.832(3)^\circ$ , and  $V = 1108.54(8)$  Å<sup>3</sup>. The structure is constructed from  $(1\bar{1}0)$  sheets of eight-coordinated Y polyhedra and C trigonal planar groups. All Y polyhedra are linked by shared edges. The Y atoms occupy six independent crystallographic sites of two different coordination types:  $[YO_7(H_2O)]$  and  $[YO_8]$ .

The chemical composition of yuchuanite-(Y) is similar to tenerite-(Y),  $Y_2(CO_3)_3 \cdot 2-3H_2O$ , but is distinct in the crystal structure, such as crystal system, space group, and unit cell, from that of tenerite-(Y). The Y polyhedra of tenerite-(Y) are nine-coordinated, while those of yuchuanite-(Y) are eight-coordinated. Moreover, their structures could be both described as sheet structures built up from Y polyhedra and  $CO_3$  trigonal planar groups but link together in significantly different ways. Thus, yuchuanite-(Y) is not a polytype of tenerite-(Y) but is an independent mineral species.

**Keywords:** New mineral, yuchuanite-(Y), hydrous yttrium carbonate, Yushui Cu deposit