

The Research History of Crichtonite Group in China and the Discovery and Study of Mianningite

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Abstract: In this thesis, the research history of crichtonite group minerals in China is reviewed, and mianningite—a new member of crichtonite group—is intensively presented in the aspects of occurrence, physical properties, chemical composition and crystal structure. The species of crichtonite are trigonal, with the formula as $A^{XII} B^{VI} C_{18}^{VI} T_2^{IV} O_{38}$. Mianningite is the fifteenth member of the crichtonite group from the Maoniuping REE deposit, Mianning county, Sichuan province, China (N28°24'20", E101°59'3"). It was found in fractures of lamprophyre veins. The empirical formula is $[\square_{0.322} (Pb_{0.215} Ba_{0.037} Sr_{0.036} Ca_{0.010})_{0.298} (Ce_{0.128} La_{0.077} Nd_{0.012})_{0.217} (Na_{0.127} K_{0.036})_{0.163}]_{1.000} (U_{0.447} Mn_{0.293} U_{0.112}^{6+} Y_{0.091} Zr_{0.023} Th_{0.011})_{0.977} (Fe_{1.224}^{3+} Fe_{0.243}^{2+} Mg_{0.023} P_{0.008} Si_{0.006} \square_{0.496})_{2.000} (Ti_{12.464} Fe_{5.292}^{3+} V_{0.118}^{5+} Nb_{0.083} Al_{0.026} Cr_{0.017}^{3+})_{18.000} O_{38.000}$. The unit-cell parameters of mianningite are $a = 1.03462(5)$ nm, $c = 2.0837(2)$ nm, $V = 1.93165(20)$ nm³, and $Z = 3$, and the space group is $R\bar{3}$. Mianningite occurs as opaque subhedral to euhedral tabular crystals, up to 1 – 2 mm in size, black in color and streak, and with a submetallic luster. Mianningite is brittle, with a conchoidal fracture. The Moh's hardness is about 6, and the density is 4.62(8) g/cm³. The crystals of mianningite were partially metamict due to the radiation of uranium. Mianningite is the first species of which the A site is mainly occupied by vacancy. It was named after its locality. The new mineral and its name have been approved by the International Mineralogical Association, Commission on New Minerals, Nomenclature and Classification (IMA CNMCN) (IMA 2014-072).

Keywords: mianningite; new mineral; crichtonite group; maoniuping; lamprophyre