

Finchite, $\text{Sr}(\text{UO}_2)_2(\text{V}_2\text{O}_8) \cdot 5\text{H}_2\text{O}$, a new uranyl sorovanadate with the francevillite anion topology

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ABSTRACT

Finchite (IMA2017-052), $\text{Sr}(\text{UO}_2)_2(\text{V}_2\text{O}_8) \cdot 5\text{H}_2\text{O}$, is the first uranium mineral known to contain essential Sr. The new mineral occurs as yellow-green blades up to $\sim 10 \mu\text{m}$ in length in surface outcrops of the calcrete-type uranium deposit at Sulfur Springs Draw, Martin County, Texas, U.S.A. Crystals of finchite were subsequently discovered underground in the Pandora mine, La Sal, San Juan County, Utah, U.S.A., as diamond-shaped golden-yellow crystals reaching up to 1 mm. The crystal structure of finchite from both localities was determined using single-crystal X-ray diffraction and is orthorhombic, *Pcan*, with $a = 10.363(6) \text{ \AA}$, $b = 8.498(5) \text{ \AA}$, $c = 16.250(9) \text{ \AA}$, $V = 1431.0(13) \text{ \AA}^3$, $Z = 4$ ($R_1 = 0.0555$) from Sulfur Springs Draw; and $a = 10.3898(16)$, $b = 8.5326(14)$, $c = 16.3765(3) \text{ \AA}$, $V = 1451.8(4) \text{ \AA}^3$, $Z = 4$ ($R_1 = 0.0600$) from the Pandora mine. Electron-probe microanalysis provided the empirical formula $(\text{Sr}_{0.88}\text{K}_{0.17}\text{Ca}_{0.10}\text{Mg}_{0.07}\text{Al}_{0.03}\text{Fe}_{0.02})_{\Sigma 1.20}(\text{UO}_2)_2(\text{V}_{2.08}\text{O}_8) \cdot 5\text{H}_2\text{O}$ for crystals from Sulfur Springs Draw, and $(\text{Sr}_{0.50}\text{Ca}_{0.28}\text{Ba}_{0.22}\text{K}_{0.05})_{\Sigma 0.94}(\text{U}_{0.99}\text{O}_2)_2(\text{V}_{2.01}\text{O}_8) \cdot 5\text{H}_2\text{O}$ for crystals from the Pandora mine, based on 17 O atoms per formula unit. The structure of finchite contains uranyl vanadate sheets based upon the francevillite topology. Finchite is a possible immobilization species for both uranium and the dangerous radionuclide ^{90}Sr because of the relative insolubility of uranyl vanadate minerals in water.

Keywords: Finchite, uranyl vanadates, carnotite, new minerals, francevillite, curienite, tyuyamunitite