

Leesite, $K(H_2O)_2[(UO_2)_4O_2(OH)_5] \cdot 3H_2O$, a new K-bearing schoepite-family mineral from the Jomac mine, San Juan County, Utah, U.S.A.

TRAVIS A. OLDS^{1,*}, JAKUB PLÁŠIL², ANTHONY R. KAMPF³, TYLER SPANO¹, PATRICK HAYNES⁴, SHAWN M. CARLSON⁵, PETER C. BURNS^{1,6}, ANTONIO SIMONETTI¹, AND OWEN P. MILLS⁷

¹Department of Civil and Environmental Engineering and Earth Sciences, University of Notre Dame, Notre Dame, Indiana 46556, U.S.A.

²Institute of Physics ASCR, v.v.i., Na Slovance 1999/2, 18221 Prague 8, Czech Republic

³Mineral Sciences Department, Natural History Museum of Los Angeles County, 900 Exposition Boulevard, Los Angeles, California 90007, U.S.A.

⁴901 Sean Street, Socorro, New Mexico 87801, U.S.A.

⁵245 Jule Lake Road, Crystal Falls, Michigan 49920, U.S.A.

⁶Department of Chemistry and Biochemistry, University of Notre Dame, Notre Dame, Indiana 46556, U.S.A.

⁷Applied Chemical and Morphological Analysis Laboratory, Michigan Technological University, Houghton, Michigan 49931, U.S.A.

ABSTRACT

Leesite (IMA2016-064), $K(H_2O)_2[(UO_2)_4O_2(OH)_5] \cdot 3H_2O$, is a new uranyl-oxide hydroxyl-hydrate found underground in the Jomac mine, Brown's Rim, White Canyon mining district, San Juan County, Utah. Laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) analyses provided the empirical formula $K_{0.67}Na_{0.004}Ca_{0.012}U_4O_{20}H_{15.31}$, based on 4 U and 20 O apfu. Sheets in the crystal structure of leesite adopt the fourmarierite anion topology, and so belong to the schoepite family of related structures that differ in the interlayer composition and arrangement, and charge of the sheet. Leesite may form as one of the principal components of "gummite" mixtures formed during the alteration of uraninite, and the unit cell of leesite resembles the previously described, but poorly understood mineral, paraschoepite. Uptake of dangerous radionuclides (⁹⁰Sr, ¹³⁵Cs, ¹³⁷Cs, ²³⁷Np, ²³⁸Pu) into the structure of leesite and other members of the family has important implications for the safe disposal of nuclear waste.

Keywords: Leesite, sheet anion topology, schoepite, uranium, uraninite, crystal structure