

Kegginite, $\text{Pb}_3\text{Ca}_3[\text{AsV}_{12}\text{O}_{40}(\text{VO})] \cdot 20\text{H}_2\text{O}$, a new mineral with a novel ϵ -isomer of the Keggin anion

ANTHONY R. KAMPF^{1,*}, JOHN M. HUGHES², BARBARA P. NASH³, AND JOE MARTY⁴

¹Mineral Sciences Department, Natural History Museum of Los Angeles County, Los Angeles, California 90007, U.S.A.

²Department of Geology, University of Vermont, Burlington, Vermont 05405, U.S.A.

³Department of Geology and Geophysics, University of Utah, Salt Lake City, Utah 84112, U.S.A.

⁴5199 E. Silver Oak Road, Salt Lake City, Utah 84108, U.S.A.

ABSTRACT

Kegginite, $\text{Pb}_3\text{Ca}_3[\text{AsV}_{12}\text{O}_{40}(\text{VO})] \cdot 20\text{H}_2\text{O}$, is a new mineral species from the Packrat mine, near Gateway, Mesa County, Colorado, U.S.A. It is a secondary mineral found on asphaltum in a montroseite- and corvusite-bearing sandstone. Other secondary minerals found in close association with kegginite are ansermetite, gypsum, mesaitite, and sherwoodite. Crystals of kegginite are orange-red simple hexagonal tablets. The streak is pinkish-orange, the luster is vitreous, the Mohs hardness is about 2, the tenacity is brittle, fracture is irregular, cleavage is good on $\{001\}$, and the calculated density is 2.69 g/cm³. Kegginite is optically uniaxial (–) with pleochroism: *O* orange-red and *E* red-orange; *E* < *O*. Electron microprobe analyses yielded the empirical formula $\text{Pb}_{2.98}\text{Ca}_{2.39}\text{Mg}_{0.56}\text{V}_{13.05}\text{As}_{0.95}\text{O}_{61}\text{H}_{40.15}$. Kegginite is trigonal, $P\bar{3}$, with $a = 14.936(5)$, $c = 15.846(5)$ Å, $V = 3061(2)$ Å³, and $Z = 2$. The crystal structure of kegginite ($R_1 = 0.064$ for 1356 $F_o > 4\sigma F$ reflections) contains a $[\text{As}^{5+}\text{V}_{12}^{5+}\text{O}_{40}(\text{VO})]^{12-}$ polyoxometalate cluster, which is a mono-capped Keggin ϵ -isomer.

Keywords: Kegginite, new mineral species, polyoxometalate, Keggin anion ϵ -isomer, crystal structure, Packrat mine, Colorado