

Lucabindiite, (K,NH₄)As₄O₆(Cl,Br), a new fumarole mineral from the “La Fossa” crater at Vulcano, Aeolian Islands, Italy

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ABSTRACT

Lucabindiite, ideally (K,NH₄)As₄O₆(Cl,Br), is a new mineral found as a medium-temperature fumarole encrustation ($T = 170\text{ }^{\circ}\text{C}$) at “La Fossa” crater of Vulcano, Aeolian Islands, Italy. The mineral deposited as aggregates of micrometer-sized hexagonal and platy crystals on the surface of the pyroclastic breccia in association with arsenolite, sal ammoniac, sulfur, and amorphous arsenic-rich sulfurite. The new mineral is colorless to white, transparent, non-fluorescent, has a vitreous luster and a white streak. The calculated density is 3.68 g/cm^3 . Lucabindiite is hexagonal, space group $P6/mmm$, with $a = 5.2386(7)\text{ \AA}$, $c = 9.014(2)\text{ \AA}$, $V = 214.23(7)\text{ \AA}^3$, and $Z = 1$. The eight strongest reflections in the X-ray powder-diffraction data [d in \AA (hkl)] are: 3.20 (100) (102), 2.62 (67) (110), 4.51 (52) (002), 4.54 (30) (100), 1.97 (28) (113), 1.49 (21) (115), 1.60 (21) (212), 2.26 (19) (112). Lucabindiite’s average chemical composition is (wt%): K₂O 5.14, As₂O₃ 84.71, Cl 3.63, Br 6.92, F 0.77, (NH₄)₂O 2.73, O=F,Cl,Br –1.84, total 102.06. The empirical chemical formula, calculated on the basis of 7 anions pfu, is $[\text{K}_{0.51}(\text{NH}_4)_{0.49}]_{\Sigma 1.00}\text{As}_{4.00}\text{O}_{5.93}(\text{Cl}_{0.48}\text{Br}_{0.40}\text{F}_{0.19})_{\Sigma 1.07}$. According to chemical analyses and X-ray data, lucabindiite is the natural analog of synthetic phases with general formula $M\text{As}_4\text{O}_6X$ where $M = \text{K}, \text{NH}_4$ and $X = \text{Cl}, \text{Br}, \text{I}$. The crystal structure is characterized by neutral As₂O₃ sheets arranged parallel to (001). The As atoms of two neighboring sheets point at each other and the sheets are separated by interlayer M (=K, NH₄) and X (=Cl, Br, F) atoms. The name is in honor of Luca Bindi (b. 1971), Professor of Mineralogy and former Head of the Division of Mineralogy of the Natural History Museum of the University of Florence. Both the mineral and the mineral name have been approved by the IMA-CNMNC Commission (IMA 2011-010).

Keywords: Lucabindiite, As-oxychlorides, new mineral, sublimates, fumaroles, crystal structure, Vulcano, Aeolian Islands, Italy