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LINDBERGITE, A NATURALLY-OCCURRING MANGANESE OXALATE DIHYDRATE FROM BRAZIL AND OTHER OCCURRENCES

Authors

ATENCIO DANIEL ¹, COUTINHO JOSÉ M.V. ¹, GRAESER STEFAN ², MATIOLI PAULO A. ³, MENEZES FILHO LUIZ A.D. ⁴

presenter's e-mail: datencio@usp.br

1 - Instituto de Geociências, USP, Brazil

2 - Naturhistorisches Museum, Basel, Switzerland

3 - Museu JOBAS. São Vicente, SP, Brazil

4 - Belo Horizonte, MG, Brazil

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Abstract

The new mineral lindbergite, $\text{Mn}(\text{C}_2\text{O}_4) \cdot 2\text{H}_2\text{O}$, is a secondary mineral in the Lavra da Boca Rica granite pegmatite, Sapucaia do Norte, Galiléia Co., Minas Gerais, Brazil. It occurs as: (1) white short prismatic crystals 0.1 to 0.3 mm, interpreted as pseudomorphous after the orthorhombic trihydrate, with faces of $\{100\}$, $\{hk0\}$, $\{010\}$, and $\{0kl\}$ forms, rounded edges and twinning on (010); (2) grayish white aggregates in 0.1 mm thick translucent crusts made up of interlocked irregularly contoured platelets up to 0.03 mm in length. Lindbergite is transparent, has a white streak, vitreous lustre, a perfect cleavage parallel $\{010\}$, and is non-fluorescent. The Mohs' hardness is 2½ and its tenacity crumbly. The measured density is 2.10(3) g/cm³ (calculated 2.251 g/cm³). Lindbergite is optically biaxial negative, a 1.424(3), b 1.550(3), g 1.65(1) (white light), 2V (meas.) 80(2)°, 2V (calc.) 77°. Dispersion is not detectable or $r > v$ very weak. Orientation $Y \wedge c = 20^\circ$. The empirical composition is $(\text{Mn}_{1.11}\text{Na}_{0.01}\text{Al}_{0.01})\text{Si}_{1.13}(\text{C}_{1.94}\text{O}_4) \cdot 2.15\text{H}_2\text{O}$. The mineral is monoclinic, $C2/c$, a 11.995(5) Å, b 5.632(2) Å, c 9.967(7) Å, β 128.34(4)°, V 528.1(5) Å³, $Z = 4$. Lindbergite is the Mn analogue of humboldtine and glushinskite. Associated minerals at the type locality are the phosphates triphylite, phosphosiderite, frondelite, strengite, cyrilovite, bermanite, rockbridgeite, huréaulite, tavorite, reddingite, heterosite, laueite, and unidentified minerals. Additional occurrences of lindbergite are Parsettens, Grisons, Switzerland, and Morefield Pegmatite, Amelia, Virginia, USA. Lindbergite was also recorded from three localities in the Black Forest, Germany: Clara Mine, Oberwolfach, Wolfach Valley, Baden-Württemberg; Ortenberg near Offenburg; and Gremmelsbach near Triberg, but the natural origin was not firmly established for the last one. An occurrence of $\text{Mn}(\text{C}_2\text{O}_4) \cdot 3\text{H}_2\text{O}$, orthorhombic, is reported at Falotta, Grisons, Switzerland.

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