

Buseckite, (Fe,Zn,Mn)S, a new mineral from the Zakłodzie meteorite

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ABSTRACT

Buseckite (IMA 2011-070), (Fe,Zn,Mn)S, is the Fe-dominant analog of wurtzite, a new member of the wurtzite group discovered in Zakłodzie, and an ungrouped enstatite-rich achondrite. The type material occurs as single-crystal grains (4–20 μm in size) in contact with two or more of enstatite, plagioclase, troilite, tridymite, quartz, and sinoite. Low-Ni iron, martensitic iron, schreibersite, keilite, cristobalite, and graphite, which are also present in the type sample, are not observed to be in contact with buseckite. Buseckite is black under diffuse illumination and nearly opaque grayish brown in transmitted light. The mean chemical composition of buseckite, as determined by electron microprobe analysis of the type material, is (wt%) S 35.84, Fe 28.68, Zn 23.54, Mn 10.04, Mg 1.18, sum 99.28, leading to an empirical formula calculated on the basis of 2 atoms of $(\text{Fe}_{0.46}\text{Zn}_{0.32}\text{Mn}_{0.16}\text{Mg}_{0.04})_{\Sigma 0.99}\text{S}_{1.01}$. Electron backscatter diffraction patterns of buseckite are a good match to that of synthetic $(\text{Zn}_{0.558}\text{Fe}_{0.442})\text{S}$ with the $P6_3mc$ structure, showing $a = 3.8357$, $c = 6.3002 \text{ \AA}$, $V = 80.27 \text{ \AA}^3$, and $Z = 2$. Buseckite is likely derived from the breakdown of high-temperature pyrrhotite to form troilite and buseckite following the solidification of sulfide-rich liquids produced during impact melting of an enstatite-rich rock.

Keywords: Buseckite, (Fe,Zn,Mn)S, new mineral, wurtzite group, sinoite, Zakłodzie meteorite, enstatite achondrite