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**LETTER**

# Browneite, MnS, a new sphalerite-group mineral from the Zakłodzie meteorite

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## ABSTRACT

Browneite (IMA 2012-008), MnS, is a new member of the sphalerite group, discovered in Zakłodzie, an ungrouped enstatite-rich achondrite. The type material occurs as one single crystal (~16 μm in size) in contact with and surrounded by plagioclase; enstatite and troilite are nearby. Low-Ni iron, martensitic iron, tridymite, quartz, cristobalite, sinoite, schreibersite, buseckite, keilite, and graphite, are also present in the type sample. Browneite is yellowish brown and translucent. The mean chemical composition, as determined by electron microprobe analysis of the type material, is (wt%) S 36.46, Mn 62.31, Fe 0.62, Ca 0.10, sum 99.49, leading to an empirical formula calculated on the basis of 2 atoms of $(Mn_{0.993}Fe_{0.010}Ca_{0.002})S_{0.995}$. Electron back-scatter diffraction patterns of browneite are a good match to that of synthetic β-MnS with the $F\bar{4}3m$ structure, showing $a = 5.601$ Å, $V = 175.71$ Å$^3$, and $Z = 4$. Browneite is a low-temperature (<200 °C) phase, metastable relative to alabandite, that postdates the impact melting and subsequent crystallization of an enstatite-rich rock.

**Keywords:** Browneite, MnS, new mineral, sphalerite group, EBSD, Zakłodzie meteorite, enstatite achondrite