

LETTER

Hibonite-(Fe), (Fe,Mg)Al₁₂O₁₉, a new alteration mineral from the Allende meteorite

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ABSTRACT

Hibonite-(Fe), (Fe,Mg)Al₁₂O₁₉, is the Fe²⁺-dominant analog of hibonite CaAl₁₂O₁₉, discovered in a highly altered Ca-,Al-rich refractory inclusion from the Allende meteorite. It occurs as scattered micrometer-sized single crystals within an aggregate of hercynite (Fe,Mg)Al₂O₄, adjacent to nepheline, ilmenite, ferroan spinel, perovskite, and hibonite. The mean chemical composition determined by electron microprobe analysis of hibonite-(Fe) is Al₂O₃ 90.05 wt%, FeO 3.60, SiO₂ 2.09, MgO 1.61, Na₂O 0.55, CaO 0.28, TiO₂ 0.04, V₂O₃ 0.02, sum 98.25, corresponding to an empirical formula of (Fe_{0.34}²⁺Mg_{0.27}Na_{0.12}Al_{0.11}Ca_{0.03})_{Σ0.87}(Al_{11.77}Si_{0.23})_{Σ12.00}O₁₉. Hibonite-(Fe) is hexagonal, *P6₃/mmc*; *a* = 5.613 Å, *c* = 22.285 Å, *V* = 608.0 Å³ and *Z* = 2. Its electron backscatter diffraction pattern is a good match to that of the hibonite structure. Hibonite-(Fe) is apparently a secondary alteration product formed by iron-alkali-halogen metasomatism, whereas hibonite is a primary refractory phase.

Keywords: Hibonite-(Fe), (Fe,Mg)Al₁₂O₁₉, a new Al-rich mineral, refractory inclusion, secondary alteration, Allende meteorite, carbonaceous chondrite, nanomineralogy