

LETTER

Hollisterite (Al₃Fe), kryachkoite (Al,Cu)₆(Fe,Cu), and stolperite (AlCu): Three new minerals from the Khatyrka CV3 carbonaceous chondrite

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ABSTRACT

Our nanomineralogy investigation of the Khatyrka CV3 carbonaceous chondrite has revealed three new alloy minerals—hollisterite (IMA 2016-034; Al₃Fe), kryachkoite [IMA 2016-062; (Al,Cu)₆(Fe,Cu)], and stolperite (IMA 2016-033; AlCu)—in section 126A of USNM 7908. Hollisterite occurs only as one crystal with stolperite, icosahedrite, and khatyrkite, showing an empirical formula of Al_{2.89}Fe_{0.77}Cu_{0.32}Si_{0.02} and a monoclinic *C2/m* structure with $a = 15.60 \text{ \AA}$, $b = 7.94 \text{ \AA}$, $c = 12.51 \text{ \AA}$, $\beta = 108.1^\circ$, $V = 1472.9 \text{ \AA}^3$, $Z = 24$. Kryachkoite occurs with khatyrkite and aluminum, having an empirical formula of Al_{5.45}Cu_{0.97}Fe_{0.55}Cr_{0.02}Si_{0.01} and an orthorhombic *Cmc2₁* structure with $a = 7.460 \text{ \AA}$, $b = 6.434 \text{ \AA}$, $c = 8.777 \text{ \AA}$, $V = 421.3 \text{ \AA}^3$, $Z = 4$. Stolperite occurs within khatyrkite, or along with icosahedrite and/or hollisterite and khatyrkite, having an empirical formula of Al_{1.15}Cu_{0.81}Fe_{0.04} and a cubic *Pm $\bar{3}m$* structure with $a = 2.9 \text{ \AA}$, $V = 24.4 \text{ \AA}^3$, $Z = 1$. Specific features of the three new minerals, and their relationships with the meteorite matrix material, add significant new evidence for the extraterrestrial origin of the Al-Cu-Fe metal phases in the Khatyrka meteorite. Hollisterite is named in honor of Lincoln S. Hollister at Princeton University for his extraordinary contributions to earth science. Kryachkoite is named in honor of Valery Kryachko who discovered the original samples of the Khatyrka meteorite in 1979. Stolperite is named in honor of Edward M. Stolper at California Institute of Technology for his fundamental contributions to petrology and meteorite research.

Keywords: Hollisterite, Al₃Fe, kryachkoite, (Al,Cu)₆(Fe,Cu), stolperite, AlCu, new minerals, Khatyrka, carbonaceous chondrite, meteorite