Icosahedrite $Al_{63}Cu_{24}Fe_{13}$

Crystal Data: Quasicrystal. *Point Group*: n.d. As anhedral to subhedral grains to 100 μm.

Physical Properties: *Cleavage*: None. *Fracture*: Uneven. *Tenacity*: Brittle. Hardness = n.d. D(meas.) = n.d. D(calc.) = n.d.

Optical Properties: Opaque. *Color*: Dark gray-black. *Streak*: Gray. *Luster*: Metallic. *Optical Class*: Isotropic.
R: (471.1) 62.3, (548.3) 60.6, (586.6) 58.1, (652.3) 56.0

Cell Data: *Space Group*: $Fm\bar{3}\bar{5}$. a_{6D} = 12.64 (six-dimensional notation)

X-ray Powder Pattern: Khatyrka meteorite.
2.006 (100), 2.108 (90), 1.238 (30), 3.41 (25), 3.75 (20), 3.24 (20), 1.452 (15)

Chemistry:

	(1)	(2)
Al	43.07	43.02
Cu	38.62	38.60
Fe	18.07	18.38
Si	0.02	
Cr	0.02	
Co	0.01	
Ca	0.01	
Zn	0.01	
Cl	0.01	.
Total	99.84	100.00

(1) Khatyrka meteorite; average of 34 electron microprobe analyses; corresponds to $Al_{63.11}Cu_{24.02}Fe_{12.78}Si_{0.03}Cr_{0.02}Co_{0.01}Ca_{0.01}Zn_{0.01}Cl_{0.01}$. (2) $Al_{63}Cu_{24}Fe_{13}$.

Occurrence: Likely formed by impact-induced shock in the Khatyrka meteorite, a CV3 carbonaceous chondrite.

Association: Spinel, diopside, forsterite, nepheline, sodalite, corundum, stishovite, khatyrkite, cupalite, an unnamed AlCuFe compound.

Distribution: From the Khatyrka meteorite.

Name: For the *icosahedr*al symmetry of its atomic structure, as observed in its diffraction pattern.

Type Material: Natural History Museum, University of Florence, Italy (46407/G).

References: (1) Bindi, L., P.J. Steinhardt, N. Yao, and P.J. Lu (2011) Icosahedrite, $Al_{63}Cu_{24}Fe_{13}$, the first natural quasicrystal. Amer. Mineral., 96, 928-931. (2) Stagno, V., L. Bindi, C. Park, S. Tkachev, V.B. Prakapenka, H.-K. Mao, R.J. Hemley, P.J. Steinhardt, and Y. Fei (2015) Quasicrystals at extreme conditions: The role of pressure in stabilizing icosahedral $Al_{63}Cu_{24}Fe_{13}$ at high temperature Amer. Mineral., 100, 2412-2418.