Hutcheonite $Ca_3Ti_2(SiAl_2)O_{12}$

Crystal Data: Cubic. *Point Group*: $4/m\,\bar{3}\,2/m$. As irregularly-shaped crystals, to 4 μm.

Physical Properties: *Cleavage*: n.d. *Fracture*: n.d. *Tenacity*: n.d. Hardness = n.d.
D(meas.) = n.d. D(calc.) = 3.86

Optical Properties: n.d. *Color*: n.d. *Streak*: n.d. *Luster*: n.d.
Optical Class: n.d.

Cell Data: *Space Group*: $Ia\bar{3}\,d$. a = 11.843 Z = 8

X-ray Powder Pattern: Calculated pattern.
2.648 (100), 1.583 (63), 2.961 (54), 2.417 (41), 0.806 (30), 1.642 (27), 1.292 (18)

Chemistry:	(1)	(2)
CaO	34.6	34.3
TiO_2	25.3	32.6
SiO_2	20.9	12.3
Al_2O_3	15.7	20.8
MgO	2.1	
FeO	0.7	
V_2O_3	0.5	.
Total	99.8	100.0

(1) Allende meteorite; average of 6 electron microprobe analyses supplemented by Raman spectroscopy; corresponds to $Ca_{2.99}(Ti^{4+}_{1.53}Mg_{0.25}Al_{0.17}Fe^{2+}_{0.05}V^{3+}_{0.03})(Si_{1.68}Al_{1.32})O_{12}$.
(2) $Ca_3Ti_2(SiAl_2)O_{12}$.

Mineral Group: Garnet supergroup, schorlomite group with $Al^{3+} > Fe^{3+}$ in the Z site.

Occurrence: A secondary phase, apparently formed by iron-alkali-halogen metasomatic alteration of primary CAI phases like melilite, perovskite, and Ti-Al-diopside.

Association: Monticellite, grossular, wadalite.

Distribution: In a Ca-Al-rich inclusion (CAI) *Egg-3* in the Allende CV3 carbonaceous chondrite meteorite.

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Type Material: In the G.J. Wasserburg Meteorite Collection, Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, California, USA (MQM803).

References: (1) Ma, C. and A.N. Krot (2014) Hutcheonite, $Ca_3Ti_2(SiAl_2)O_{12}$, a new garnet mineral from the Allende meteorite: An alteration phase in a Ca-Al-rich inclusion. Amer. Mineral., 99, 667-670.