

Hexamolybdenum

(Mo,Ru,Fe)

Crystal Data: Hexagonal. *Point Group:* 6/m 2/m 2/m. As euhedral grains, to 1.2 μm .

Physical Properties: *Cleavage:* n.d. *Fracture:* n.d. *Tenacity:* n.d. *Hardness:* = n.d.
D(meas.) = n.d. D(calc.) = 11.99

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

Cell Data: *Space Group:* $P6_3/mmc$. $a = 2.7506$ $c = 4.4318$ $Z = 2$

X-ray Powder Pattern: Calculated pattern.

2.098 (100), 2.216 (26), 2.382 (24), 1.169 (20), 1.255 (18), 1.375 (17), 1.622 (15)

Chemistry:	(1)	(2)
Fe	4.27	2.60
Ni	0.47	n.d.
Mo	51.61	33.62
Ru	23.04	15.78
W	1.90	5.99
Os	5.63	2.01
Ir	12.00	40.01
Pt	0.23	n.d.
Total	99.15	100.00

(1) Allende meteorite; average of 6 electron microprobe analyses supplemented by Raman spectroscopy; corresponds to $(\text{Mo}_{0.564}\text{Ru}_{0.239}\text{Fe}_{0.080}\text{Ir}_{0.066}\text{Os}_{0.031}\text{W}_{0.018}\text{Ni}_{0.008}\text{Pt}_{0.001})$.

(2) Allende meteorite; electron microprobe analysis supplemented by Raman spectroscopy; corresponds to $(\text{Mo}_{0.436}\text{Ir}_{0.259}\text{Ru}_{0.194}\text{Fe}_{0.058}\text{W}_{0.040}\text{Os}_{0.013})$.

Occurrence: As grains in an ovoid-shaped, ultra-refractory inclusion in the Allende meteorite, likely a high-temperature condensate early in the formation of the solar system.

Association: Perovskite, Os-Ir-Mo-W alloys, Sc-stabilized tazheranite (cubic zirconia).

Distribution: In ultra-refractory inclusion *ACM-I*, Allende CV3 carbonaceous chondrite meteorite.

Name: Alludes to the symmetry (primitive hexagonal) and composition (molybdenum-rich).

Type Material: National Museum of Natural History, Washington, D.C., USA
(USNM 3509HC12 and 7590).

References: (1) Ma, C., J.R. Beckett, and G.R. Rossman (2014) Allendeite ($\text{Sc}_4\text{Zr}_3\text{O}_{12}$) and hexamolybdenum (Mo,Ru,Fe), two new minerals from an ultrarefractory inclusion from the Allende meteorite. *Amer. Mineral.*, 99, 654-666.