

Crystal Data: Hexagonal. *Point Group:* $3/m$. As ovoidal to cloud-shaped grains to 50 μm (meteorites) or to ~0.2 mm (paralava).

Physical Properties: *Cleavage:* None. *Tenacity:* n.d. *Fracture:* n.d. *Hardness:* = n.d. $D(\text{meas.}) = \text{n.d.}$ $D(\text{calc.}) = 3.122$

Optical Properties: Transparent. *Color:* Colorless. *Streak:* n.d. *Luster:* Vitreous. *Optical Class:* Uniaxial (-). $\omega = 1.622(1)$ $\varepsilon = 1.619(1)$ Nonpleochroic.

Cell Data: *Space Group:* $R3c$. $a = 10.3330(4)$ $c = 37.0668(24)$ $Z = 6$

X-ray Powder Pattern: Calculated pattern. 2.8544 (100), 2.5833 (64), 3.1772 (46), 1.7123 (28), 5.1665 (25), 3.4245 (24), 1.9153 (22)

Chemistry:	(1)	(2)
CaO	48.87	48.39
MgO	3.90	3.73
Na ₂ O		0.86
FeO	1.33	
<u>P₂O₅</u>	<u>46.24</u>	<u>45.85</u>
Total	100.34	98.83

(1) Marjalahti pallasite meteorite; average electron microprobe analysis; corresponding to $\text{Ca}_{9.00}(\text{Ca}_{0.33}\text{Fe}^{2+}_{0.20}\square_{0.47})_{\Sigma=1.00}\text{Mg}_{1.04}\text{P}_{6.97}\text{O}_{28}$. (2) Hatrurim Basin, northern Negev Desert, Israel; average electron microprobe analysis; corresponding to $\text{Ca}_{9.00}(\text{Ca}_{0.35}\text{Na}_{0.30})_{\Sigma=0.65}\text{Mg}_{1.00}(\text{PO}_4)_7$.

Polymorphism & Series: The isomorphous series merrillite-keplerite represents the main reservoir of phosphate phosphorus in the solar system.

Mineral Group: Whitlockite group.

Occurrence: In some pallasite and angrite meteorites. In brecciated, altered pyroxene paralava (fused sediments) by pyrometamorphism (Israel). An indicator of high-temperature environments characterized by extreme depletion of sodium.

Association: Troilite-orthopyroxene vermicular intergrowths, olivine, Fe-Ni metal (meteorites); fluorapatite, maghemite, stanfieldite (Israel).

Distribution: From a hill, near Arad, Hatrurim Basin, northern Negev Desert, Israel. Studied material from the Marjalahti pallasite meteorite [TL].

Name: Honors Johannes *Kepler* (1571-1630), a prominent German naturalist, for his contributions to astronomy and crystallography.

Type Material: Mining Museum, St. Petersburg Mining University, St. Petersburg, Russia (MM74/2-1).

References: (1) Britvin, S.N., I.O. Galuskina, N.S. Vlasenko, O.S. Vereshchagin, V.N. Bocharov, M.G. Krzhizhanovskaya, V.V. Shilovskikh, E.V. Galuskin, Y. Vapnik, and E.V. Obolonskaya (2021) Keplerite, $\text{Ca}_9(\text{Ca}_{0.5}\square_{0.5})\text{Mg}(\text{PO}_4)_7$, a new meteoritic and terrestrial phosphate isomorphous with merrillite, $\text{Ca}_9\text{NaMg}(\text{PO}_4)_7$. *Amer. Mineral.*, 106, 1917-1927.