Czochralskiite $Na_4Ca_3Mg(PO_4)_4$

Crystal Data: Orthorhombic. *Point Group*: 2/*m* 2/*m* 2/*m*. As oval and amoeboid aggregates, with individual grains to 0.15 mm.

Physical Properties: *Tenacity*: Brittle. *Fracture*: Irregular, conchoidal. Hardness = 4-5 VHN = 403(18) (50 g load). D(meas.) = n.d. D(calc.) = 3.132

Optical Properties: Transparent. *Color*: Colorless, gray with light internal reflections in reflected light. *Streak*: White. *Luster*: Vitreous.
Optical Class: Biaxial (+). α = 1.608(2) β = 1.611(2) γ = 1.616(2) 2V(meas.) = 70(10)° 2V(calc.) = 76° *Dispersion*: Very weak. *Orientation*: *X* = *a*, *Y* = *b*, *Z* = *c*.

Cell Data: *Space Group*: *Pnma*. *a* = 17.9230(2) *b* = 10.7280(2) *c* = 6.7794(1) Z = 4

X-ray Powder Pattern: Calculated pattern.
2.726 (100), 2.602 (83), 2.679 (63), 3.802 (48), 1.901 (44), 3.728 (31), 2.240 (16)

Chemistry:

	(1)
P_2O_5	46.28
FeO	0.32
MnO	0.16
CaO	27.59
MgO	6.21
K_2O	0.09
Na_2O	20.04
Total	100.69

(1) Morasko IAB-MG iron meteorite; average of 12 electron microprobe analyses supplemented by Raman spectroscopy; corresponding to $Na_{3.97}Ca_{3.02}Mg_{0.95}Mn^{2+}_{0.01}K_{0.01}Fe^{2+}_{0.03}(PO_4)_{4.00}$.

Occurrence: A primary phase in graphite-bearing nodules, in an iron meteorite.

Association: Graphite, triolite, schreibersite, cohenite, merrillite, brianite, fluorapatite, kamacite, taenite, tetrataenite.

Distribution: From the Morasko IAB-MG iron meteorite.

Name: Honors Jan Czochralski (1885-1953), a Polish chemist, crystallographer and metallurgist, the inventor of the method of production of synthetic silicon crystals known as Czochralski's method.

Type Material: Mineralogical Museum, University of Wrocław, Poland (MM UWr IV7870).

References: (1) Karwowski, Ł., R. Kryza, A. Muszyński, J. Kusz, K. Helios, P. Drożdżewski, and E.V. Galuskin (2016) Czochralskiite, $Na_4Ca_3Mg(PO_4)_4$, a second new mineral from the Morasko IAB-MG iron meteorite (Poland). Eur. J. Mineral., 28(6), 969-977. (2) (2017) Amer. Mineral., 102, 1566 (abs. ref. 1).