Armellinoite-(Ce) $Ca_4Ce^{4+}(AsO_4)_4 \cdot H_2O$

Crystal Data: Tetragonal. *Point Group*: 4/*m*. As pseudo-octahedral crystals < 200 μm.

Physical Properties: *Cleavage*: Fair on {110} and {100}. *Tenacity*: Brittle. *Fracture*: Irregular. Hardness = ~3-3.5 D(meas.) = n.d. D(calc.) = 4.29 Nonfluorescent.

Optical Properties: Translucent. *Color*: Pale yellow to brown-yellow. *Streak*: White.
Luster: Resinous to vitreous.
Optical Class: Uniaxial (-). ω = 1.795(5) ε = 1.765(5) Non-pleochroic.

Cell Data: *Space Group: I*4$_1$/*a*. *a* = 10.749(2) *c* = 12.030(2) Z = 4

X-Ray Diffraction Pattern: Montaldo di Mondovì mine, Corsaglia Valley, Piedmont, Italy.
2.957 (100), 7.983 (36), 1.475 (26), 4.443 (23), 1.875 (22), 1.728 (19), 2.398 (14)

Chemistry:

	(1)	(2)
P_2O_5	0.06	
CaO	24.81	25.66
As_2O_5	52.26	52.60
SrO	0.19	
Y_2O_3	0.99	
La_2O_3	0.48	
CeO_2	14.84	19.68
Pr_2O_3	0.14	
Nd_2O_3	2.43	
Sm_2O_3	0.41	
Gd_2O_3	0.66	
Dy_2O_3	0.21	
Er_2O_3	0.04	
Yb_2O_3	0.05	
Ho_2O_3	0.23	
Lu_2O_3	0.05	
ThO_2	2.33	
F	0.32	
H_2O	[1.74]	2.06
-O = F	0.13	.
Total	102.21	100.00

(1) Montaldo di Mondovì mine, Corsaglia Valley, Piedmont, Italy; average electron microprobe and Raman spectroscopic analyses, H_2O calculated; corresponds to $^{A}(Ca_{3.89}Th_{0.08}Sr_{0.02}La_{0.03})_{\Sigma=4.02}$ $^{B}(Ce^{4+}_{0.76}Nd_{0.13}Y_{0.08}Gd_{0.03}Sm_{0.02}Pr_{0.01}Dy_{0.01}Ho_{0.01})_{\Sigma=1.05}[(As_{1.00}P_{0.01})_{\Sigma=1.01}O_4]_4 \cdot [(H_2O)_{0.85}F_{0.15}]_{\Sigma=1.00}$.
(2) $Ca_4Ce^{4+}(AsO_4)_4 \cdot H_2O$.

Occurrence: In Fe-Mn ore in metaquartzites.

Association: Quartz, hematite, cryptomelane/hollandite, tilasite, muscovite, braunite, montmorillonite.

Distribution: In the dumps of the Montaldo di Mondovì mine, Frazze Rocconi, Borgata Oberti, Montaldo di Mondovì (CN), Corsaglia Valley, Piedmont, Italy.

Name: Honors Gianluca *Armellino* (b. 1962), Millesimo, Savona province, Liguria, Italy, who first found more than 40 mineral species new for the Liguria region including this species.

Type Material: Department of Earth Science, University of Milan, Italy (MCMGPG-H2018-003).

References: (1) Cámara, F., M.E. Ciriotti, U. Kolitsch, F. Bosi, E. Bittarello, P. Brizio, P. Vignola, and G. Blaß (2021) Armellinoite-(Ce), $Ca_4Ce^{4+}(AsO_4)_4 \cdot H_2O$, a new mineral species isostructural with pottsite, $(Pb_3Bi)Bi(VO_4)_4 \cdot H_2O$. Mineral. Mag., 85, 901-909.