Graulichite-(La) $LaFe^{3+}_3(AsO_4)_2(OH)_6$

Crystal Data: Hexagonal. *Point Group*: $\bar{3}\,2/m$. As porous rhombohedral crystals to 0.1 mm.

Physical Properties: *Cleavage*: None. *Tenacity*: Brittle. *Fracture*: Irregular. Hardness = ~3.5 by analogy in the group. D(meas.) = n.d. D(calc.) = 3.907 (domain 1); 3.962 (domain 2)

Optical Properties: Transparent. *Color*: Yellow. *Streak*: Light yellow. *Luster*: Resinous. *Optical Class*: *n*(calc.) = 1.889 (domain 1) and 1.928 (domain 2) *Pleochroism*: Very weak, light yellow to yellow.

Cell Data: *Space Group: R*$\bar{3}$ *m*. *a* = 7.252(13) *c* = 16.77(3) Z = 3

X-Ray Diffraction Pattern: Patte d'Oie mine, Bou Skour mining district, Morocco.
3.045 (s), 5.86 (m), 2.239 (m), 1.478 (m), 2.511 (mw), 1.960 (mw), 1.813 (mw)

Chemistry:

	(1)	(2)	(3)
SO_3	4.98	5.26	
P_2O_5	4.66	5.85	
As_2O_5	23.68	17.31	33.49
Al_2O_3	7.19	4.08	
Fe_2O_3	28.75	34.19	34.90
La_2O_3	9.14	10.27	23.74
Ce_2O_3	5.46	5.82	
CaO	1.01	0.82	
CuO	2.63	2.57	
SrO	1.24	1.75	
PbO	1.74	1.94	
K_2O	0.32	0.48	
H_2O	[9.22]	[9.68]	7.88
Total	100.00	100.00	100.00

(1) Patte d'Oie mine, Bou Skour mining district, Morocco; average electron microprobe analysis supplemented by Raman spectroscopy, H_2O calculated from structure; normalized domain one corresponds to $(La_{0.34}Ce_{0.20}Ca_{0.11}Sr_{0.07}Pb_{0.05}K_{0.04})_{\Sigma=0.81}(FeAl_{0.84}Cu_{0.20})_{\Sigma=3.20}(As_{1.23}P_{0.39}S_{0.37})_{\Sigma=1.99}O_{14}H_{6.13}$. (2) Do.; average electron microprobe analysis supplemented by Raman spectroscopy, H_2O calculated from structure; normalized domain two corresponds to $(La_{0.38}Ce_{0.22}Sr_{0.10}Ca_{0.09}Pb_{0.05}K_{0.06})_{\Sigma=0.90}(FeAl_{0.49}Cu_{0.20})_{\Sigma=3.29}(As_{0.91}P_{0.50}S_{0.40})_{\Sigma=1.81}O_{14}H_{6.53}$. (3) $LaFe^{3+}_3(AsO_4)_2(OH)_6$.

Mineral Group: Alunite supergroup, dussertite group.

Occurrence: In a secondary oxidation assemblage in a sulfide deposit.

Association: Agardite-(La), malachite, conichalcite.

Distribution: From the Patte d'Oie mine, Bou Skour mining district, Djebel Saghro mountain range, ~50 km southeast of Ouarzazate, Morocco.

Name: The suffix indicates the La analogue of *graulichite*-(Ce).

Type Material: Museum of Natural History, University of Pisa, Italy (19924).

References: (1) Biagioni, C., M.E. Ciriotti, G. Favreau, D. Mauro, and F. Zaccarini (2022) Graulichite-(La), $LaFe^{3+}_3(AsO_4)_2(OH)_6$, a new addition to the alunite supergroup from the Patte d'Oie mine, Bou Skour mining district, Morocco. Eur. J. Mineral., 34(3), 365-374.