Cobaltarthurite $Co^{2+}Fe^{3+}_2(AsO_4)_2(OH)_2 \cdot 4H_2O$

Crystal Data: Monoclinic. *Point Group*: 2/*m*. As globular to coalesced pellet-like aggregates, to 1.5 mm, comprised of fibrous crystals, to 75 μm.

Physical Properties: *Cleavage*: None observed. *Tenacity*: Brittle. Hardness = 3.5-4
D(meas.) = 3.22(2) D(calc.) = 3.33 Readily soluble in 1:1 HCl.

Optical Properties: Translucent. *Color*: Straw-yellow (exterior) to dark brown (core).
Streak: White to light brown. *Luster*: Vitreous (crystals); silky (tufts).
Optical Class: Biaxial (+). $\alpha = 1.741$ $\beta = 1.762$ $\gamma = 1.797$ 2V(calc.) = 77° *Orientation*: $Z = \sim c$.
Pleochroism: Distinct, *X* = colorless, *Z* = medium yellow. *Absorption*: *Z* > *X*, *Y*. Parallel extinction and length slow.

Cell Data: *Space Group*: $P2_1/c$. $a = 10.2635(9)$ $b = 9.7028(8)$ $c = 5.5711(5)$ $\beta = 94.207(1)°$ Z = 2

X-ray Powder Pattern: Dolores showing, near Pastrana, Province of Murcia, southeastern Spain. 7.04 (100), 10.2 (95), 4.81 (65), 4.24 (60), 2.87 (55), 2.89 (25), 4.51 (20)

Chemistry:

	(1)
MgO	0.89
MnO	1.14
CoO	7.06
CuO	0.20
Fe_2O_3	31.88
As_2O_5	42.57
P_2O_5	0.56
SO_3	0.07
H_2O	[16.64]
Total	101.01

(1) Dolores showing, near Pastrana, Province of Murcia, southeastern Spain; by electron microprobe, average of 10 analyses, H_2O calculated; corresponding to $(Co_{0.50}Mg_{0.12}Fe^{3+}_{0.11}Mn_{0.08}Cu_{0.01}\square_{0.11})_{\Sigma=0.93}Fe^{3+}_2[(AsO_4)_{1.95}(PO_4)_{0.04}(SO_4)_{0.01}]_{\Sigma=2.00}(OH)_{1.74} \cdot 4H_2O$.

Mineral Group: Arthurite group.

Occurrence: Product of oxidation in a near-surface, sulfide-depleted lens.

Association: Pharmacosiderite, conichalcite, olivenite, jarosite, arseniosiderite, scorodite, malachite, azurite, chlorargyrite, mixite, lavendulan.

Distribution: From the Dolores showing, near Pastrana, ~10 km east of Mazarrón, Province of Murcia, southeastern Spain. At Khder, Bou Azzer district, Morocco.

Name: For a member of the *arthurite* group with essential *cobalt* in the composition.

Type Material: Canadian Museum of Nature, Ottawa, Ontario (NMNMC 83399).

References: (1) Jambor, J.L., J. Viñals, L.A. Groat, and M. Raudsepp (2002) Cobaltarthurite, $Co^{2+}Fe^{3+}_2(AsO_4)_2(OH)_2 \cdot 4H_2O$, a new member of the arthurite group. Can. Mineral., 40, 725-732. (2) Raudsepp, M. and E. Pani (2002) The crystal structure of cobaltarthurite, $Co^{2+}Fe^{3+}_2(AsO_4)_2(OH)_2 \cdot 4H_2O$: a Rietveld refinement. Can. Mineral., 40, 733-737. (3) (2003) Amer. Mineral., 88, 475-476 (abs. refs. 1 and 2). (4) Kampf, A.R. (2005) The crystal structure of cobaltarthurite from the Bou Azzer district, Morocco: the location of hydrogen atoms in the arthurite structure-type. Can. Mineral., 43, 1387-1391. (5) (2006) Amer. Mineral., 91(4), 715 (abs. ref. 4 and comment).