Carlosbarbosaite $(UO_2)_2Nb_2O_6(OH)_2\cdot 2H_2O$

Crystal Data: Orthorhombic. *Point Group*: 2/*m* 2/*m* 2/*m*. As bent fibrous crystals to 0.12 mm, elongated along [001] and flattened on (100), and displaying {001}, {100} and {010}.

Physical Properties: *Cleavage*: Presumed to be {100} and {010}. *Fracture*: Uneven. *Tenacity*: Flexible. Hardness = n.d. D(meas.) = n.d. D(calc.) = 4.713 and 4.172 (for the samples noted below under 'Chemistry')

Optical Properties: Transparent to translucent. *Color*: Cream to pale yellow. *Streak*: Yellowish white. *Luster*: Vitreous.
Optical Class: Biaxial (+). $\alpha = 1.760$ $\beta = 1.775$ $\gamma = 1.795$ 2V(meas.) = 70(1)°
2V(calc.) = 83° *Pleochroism*: Weak, shades of yellowish green. *Orientation*: $X = a$, $Y = b$, $Z = c$.

Cell Data: *Space Group*: *Cmcm*. $a = 14.150(6)$ $b = 10.395(4)$ $c = 7.529(3)$ Z = 4

X-ray Powder Pattern: Jaguaraçu pegmatite, Minas Gerais, Brazil.
7.081 (100), 4.201 (90), 8.405 (80), 3.053 (80), 2.931 (70), 3.333 (60), 2.803 (60)

Chemistry:

	(1)	(2)
UO_3	54.52	41.83
CaO	2.07	2.10
Ce_2O_3	0.33	0.31
Nd_2O_3	0.49	1.12
Nb_2O_5	14.11	14.64
Ta_2O_5	15.25	16.34
TiO_2	2.20	0.95
SiO_2	2.14	3.55
Fe_2O_3	1.08	0.89
Al_2O_3	0.73	0.71
H_2O	[11.49]	[14.99]
Total	104.41	97.43

(1) Jaguaraçu pegmatite, Minas Gerais, Brazil; average of 7 electron microprobe analyses, H_2O calculated, OH and H_2O confirmed by IR spectroscopy; corresponds to $(\square_{0.68}Ca_{0.28}Nd_{0.02}Ce_{0.02})_{\sum=1.00}[U_{1.44}\square_{0.56}O_{2.88}(H_2O)_{1.12}](Nb_{0.80}Ta_{0.52}Si_{0.27}Ti_{0.21}Al_{0.11}Fe_{0.10})_{\sum=2.01}O_{4.72}(OH)_{3.20}(H_2O)_{2.08}$.
(2) Same as above; corresponding to $(\square_{0.67}Ca_{0.27}Nd_{0.05}Ce_{0.01})_{\sum=1.00}[U_{1.04}\square_{0.96}O_{2.08}(H_2O)_{1.92}](Nb_{0.79}Ta_{0.53}Si_{0.42}Ti_{0.08}Al_{0.10}Fe_{0.08})_{\sum=2.00}O_{4.00}(OH)_{3.96}(H_2O)_{2.04}$.

Polymorphism & Series: Forms a series between end members $(UO_2)_2Nb_2O_6(OH)_2(H_2O)_2$ and $(H_2O)_4Nb_2[O_2(OH)_4](OH)_2(H_2O)_2$.

Occurrence: A late-stage cavity filling in albite in a complex pegmatite.

Association: Albite, muscovite, zircon, kaolinite, columbite-(Fe).

Distribution: From the Jaguaraçu pegmatite, Minas Gerais, Brazil.

Name: Honors Carlos do Prado Barbosa (1917-2003), a chemical engineer, who as a dealer in mineral specimens, promoted the discovery and scientific study of rare mineral species.

Type Material: Museu de Geociências, Instituto de Geociências, Universidade de São Paulo, São Paulo, Brazil (DR707) and in the Systematic Reference Series, National Mineral Collection, Geological Survey, Ottawa, Ontario, Canada.

References: (1) Atencio, D., A.C. Roberts, M.A. Cooper, L.A.D. Menezes Filho, J.M.V. Coutinho, J.A.R. Stirling, K.E. Venance, N.A. Ball, E. Moffatt, M.L.S.C. Chaves, P.R.G. Brandão, and A.W. Romano (2012) Carlosbarbosaite, ideally $(UO_2)_2Nb_2O_6(OH)_2\cdot 2H_2O$, a new hydrated uranyl niobate mineral with tunnels from Jaguaraçu, Minas Gerais, Brazil: description and crystal structure. Mineral. Mag. 76, 75-90. (2) (2012) Amer. Mineral., 97, 1526 (abs. ref. 1).