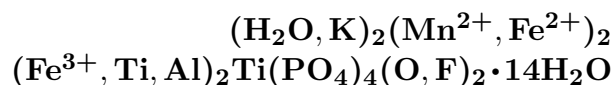


**Benyacarite**

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**Crystal Data:** Orthorhombic. *Point Group:*  $2/m\ 2/m\ 2/m$ . As crystals, to 2 mm, tabular on {010}, equant {111}, with {001}, more rarely {100}.

**Physical Properties:** *Cleavage:* Perfect on {010}; parting on {101}. *Fracture:* Uneven. *Tenacity:* Very brittle. Hardness = 2.5–3 D(meas.) = n.d. D(calc.) = 2.37

**Optical Properties:** Transparent to translucent. *Color:* Greenish yellow, may be pale brown, almost colorless; pale yellow to colorless in thin section. *Streak:* White. *Luster:* Vitreous. *Optical Class:* Biaxial (+). *Orientation:*  $X = b$ ;  $Y = c$ ;  $Z = a$ .  $\alpha = 1.612(3)$   $\beta = 1.621(3)$   $\gamma = 1.649(3)$   $2V(\text{meas.}) = 60(3)^\circ$

**Cell Data:** *Space Group:*  $Pbca$ .  $a = 10.561(5)$   $b = 20.585(8)$   $c = 12.516(2)$   $Z = 4$

**X-ray Powder Pattern:** El Criollo pegmatite, Argentina. 6.26 (100), 3.13 (100), 10.29 (90), 7.51 (80), 3.76 (50), 5.16 (40), 3.96 (40)

<b>Chemistry:</b>	(1)		(1)	
	P <sub>2</sub> O <sub>5</sub>	28.1	CaO	0.1
	TiO <sub>2</sub>	12.3	Na <sub>2</sub> O	0.2
	Al <sub>2</sub> O <sub>3</sub>	0.7	K <sub>2</sub> O	1.6
	Fe <sub>2</sub> O <sub>3</sub>	11.0	F	1.5
	FeO	2.8	H <sub>2</sub> O	[28.9]
	MnO	11.2	–O = F <sub>2</sub>	[0.6]
	MgO	0.3	<hr/>	
			Total	[98.1]

(1) El Criollo pegmatite, Argentina; by electron microprobe, FeO:Fe<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O assumed from crystal-structure determination; corresponding to  $[(\text{H}_2\text{O})_{0.78}\text{K}_{0.32}\text{Na}_{0.06}]_{\Sigma=1.16}(\text{Mn}_{1.50}^{2+}\text{Fe}_{0.42}^{2+}\text{Mg}_{0.07}\text{Ca}_{0.01})_{\Sigma=2.00}(\text{Fe}_{1.36}^{3+}\text{Ti}_{0.56}\text{Al}_{0.14})_{\Sigma=2.06}\text{Ti}_{1.00}(\text{PO}_4)_4(\text{O}_{1.20}\text{F}_{0.80})_{\Sigma=2.00} \cdot 14\text{H}_2\text{O}$ .

**Occurrence:** A rare secondary mineral in a complex zoned granite pegmatite.

**Association:** Phosphosiderite, strengite, pachnolite, apatite, torbernite.

**Distribution:** From the El Criollo pegmatite, Cerro Blanco, Tanti district, 45 km west of Córdoba, Córdoba Province, Argentina. In Germany, at Hagendorf, and on the Kreuzberg, Pleystein, Bavaria. From Folgoso, near Gouveia, Portugal.

**Name:** To honor María Angélica R. de Benyacar (1928–), National Atomic Energy Commission, Buenos Aires, Argentina, for her mineralogical studies.

**Type Material:** Department of Earth Sciences, University of Milan, Milan, Italy.

**References:** (1) Demartin, F., T. Pilati, H.D. Gay, and C.M. Gramaccioli (1993) The crystal structure of a mineral related to paulkerrite. *Zeits. Krist.*, 208, 57–71. (2) (1994) *Amer. Mineral.*, 79, 763 (abs. ref. 1). (3) Demartin, F., H.D. Gay, C.M. Gramaccioli, and T. Pilati (1997) Benyacarite, a new titanium-bearing phosphate mineral species from Cerro Blanco, Argentina. *Can. Mineral.*, 35, 707–712.