

**Mantiennéite****KMg<sub>2</sub>Al<sub>2</sub>Ti(PO<sub>4</sub>)<sub>4</sub>(OH)<sub>3</sub>•15H<sub>2</sub>O**

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**Crystal Data:** Orthorhombic. *Point Group:* 2/m 2/m 2/m. As radially fibrous spherules, to 1 mm.

**Physical Properties:** *Cleavage:* Perfect on {001}; poor on {010}. *Tenacity:* Brittle. Hardness = 2–3 D(meas.) = 2.31(1) D(calc.) = 2.25

**Optical Properties:** Translucent. *Color:* Caramel-brown to brownish honey-yellow. *Streak:* Pale brown with a rose tint. *Luster:* Vitreous. *Optical Class:* Biaxial (-). *Pleochroism:* Weak; X = colorless; Z = very pale yellow. *Orientation:* X = b; Y = c; Z = a. *Dispersion:* r > v. α = 1.564 β = n.d. γ = 1.598 2V(meas.) = 50°–60°

**Cell Data:** *Space Group:* Pbca. a = 10.409(2) b = 20.330(4) c = 12.312(2) Z = 4

**X-ray Powder Pattern:** Anloua, Cameroon. 6.158 (100), 3.076 (60), 10.18 (40), 7.41 (30), 3.104 (30), 2.949 (30), 2.839 (25)

<b>Chemistry:</b>	(1)	(2)
P <sub>2</sub> O <sub>5</sub>	31.96	31.87
TiO <sub>2</sub>	9.00	8.97
Al <sub>2</sub> O <sub>3</sub>	10.51	11.45
Fe <sub>2</sub> O <sub>3</sub>	5.63	
MnO	0.15	
MgO	6.51	9.05
CaO	0.30	
Na <sub>2</sub> O	0.18	
K <sub>2</sub> O	2.81	5.29
H <sub>2</sub> O	32.95	33.37
Total	[100.00]	100.00

(1) Anloua, Cameroon; average of two analyses, H<sub>2</sub>O by the Penfield method, recalculated after removal of quartz 5.42% and siderite 6.42% impurities; then corresponding to (K<sub>0.53</sub>Na<sub>0.05</sub>)<sub>Σ=0.58</sub>(Mg<sub>1.43</sub>Fe<sub>0.46</sub>Ca<sub>0.05</sub>Mn<sub>0.02</sub>)<sub>Σ=1.96</sub>(Al<sub>1.83</sub>Fe<sub>0.17</sub>)<sub>Σ=2.00</sub>Ti<sub>1.00</sub>(PO<sub>4</sub>)<sub>4.00</sub>(OH)<sub>2.96</sub>•14.77H<sub>2</sub>O.

(2) KMg<sub>2</sub>Al<sub>2</sub>Ti(PO<sub>4</sub>)<sub>4</sub>(OH)<sub>3</sub>•15H<sub>2</sub>O.

**Occurrence:** Replacing minerals in and forming the matrix of sandy layers in lacustrine shale.

**Association:** Kaolinite, siderite, quartz, vivianite, organic matter.

**Distribution:** From Anloua, near Ngaoundéré, Cameroon.

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**Type Material:** National School of Mines, Paris, France.

**References:** (1) Franolet, A.-M., P. Oustrière, F. Fontan, and F. Pillard (1984) La mantiennéite, une nouvelle espèce minérale du gisement de vivianite d'Anloua, Cameroun. Bull. Minéral., 107, 737–744 (in French with English abs.). (2) (1985) Amer. Mineral., 70, 1330 (abs. ref. 1).