

Wyllieite $(\text{Na, Ca, Mn}^{2+})(\text{Mn}^{2+}, \text{Fe}^{2+})(\text{Fe}^{2+}, \text{Fe}^{3+}, \text{Mg})\text{Al}(\text{PO}_4)_3$

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Crystal Data: Monoclinic. *Point Group:* $2/m$. Granular, to 15 cm.

Physical Properties: Hardness = $[> 4]$ (by analogy to ferrowyllieite). $D(\text{meas.}) = \text{n.d.}$
 $D(\text{calc.}) = [3.61]$

Optical Properties: Semitransparent. *Color:* Bottle-green, pale greenish gray.

Luster: [Vitreous to submetallic].

Optical Class: Biaxial (+). *Pleochroism:* $X = \text{colorless}; Y = Z = \text{bluish green.}$ $\alpha = 1.685(2)$
 $\beta = 1.688(2)$ $\gamma = 1.692(2)$ $2V(\text{meas.}) = 90^\circ$ $2V(\text{calc.}) = 82^\circ$

Cell Data: *Space Group:* $P2_1/n$. $a = 11.967(2)$ $b = 12.462(3)$ $c = 6.409(1)$
 $\beta = 114^\circ 38(1)'$ $Z = 4$

X-ray Powder Pattern: n.d.

Chemistry:

| | (1) | (2) |
|-------------------------|-------|-------|
| P_2O_5 | 45.41 | 44.32 |
| Al_2O_3 | 6.48 | 7.91 |
| Fe_2O_3 | 10.62 | |
| FeO | 14.73 | 15.81 |
| MnO | 11.22 | 17.82 |
| ZnO | 0.41 | |
| MgO | 1.71 | 2.17 |
| CaO | 3.12 | 0.33 |
| Na_2O | 3.93 | 9.70 |
| K_2O | 0.05 | 0.07 |
| H_2O | 0.92 | |
| insol. | 1.22 | |
| Total | 99.82 | 98.13 |

(1) Old Mike mine, South Dakota, USA; corresponds to $(\text{Na}_{0.59}\text{Ca}_{0.26}\text{Mn}_{0.10}^{2+})_{\Sigma=0.95}$
 $(\text{Mn}_{0.64}\text{Fe}_{0.36}^{2+})_{\Sigma=1.00}(\text{Fe}_{0.57}\text{Fe}_{0.21}^{3+}\text{Mg}_{0.20}\text{Zn}_{0.02})_{\Sigma=1.00}(\text{Al}_{0.59}\text{Fe}_{0.41}^{3+})_{\Sigma=1.00}(\text{PO}_4)_3$. (2) Buranga,
Rwanda; corresponds to $(\text{Na}_{0.80}\text{K}_{0.01})_{\Sigma=0.81}(\text{Na}_{0.70}\text{Mn}_{0.27}\text{Ca}_{0.03})_{\Sigma=1.00}(\text{Mn}_{0.94}\text{Fe}_{0.06}^{2+})_{\Sigma=1.00}$
 $(\text{Fe}_{0.84}\text{Mg}_{0.16})_{\Sigma=1.00}(\text{Al}_{0.75}\text{Fe}_{0.15}^{3+}\text{Mg}_{0.10})_{\Sigma=1.00}(\text{PO}_4)_3$.

Polymorphism & Series: Forms two series, with ferrowyllieite, and with rosemaryite; Mn^{2+}
 $> \text{Fe}^{2+}$ in M(1); Fe^{2+} dominant in M(2a).

Occurrence: In zoned complex granite pegmatites.

Association: Trolleite, scorzalite (Buranga, Rwanda).

Distribution: In the USA, in South Dakota, from the Old Mike mine, six km north-northwest
of Custer, Custer Co. At the Buranga pegmatite, near Gatumba, Rwanda. From Hålsjöberg,
Värmland, Sweden. At the Lavra do Énio pegmatite, northeast of Galiléia, Minas Gerais, Brazil.

Name: To honor Dr. Peter John Wyllie (1930–), Professor of Petrology and Geochemistry,
University of Chicago, Chicago, Illinois, USA.

Type Material: National Museum of Natural History, Washington, D.C., USA, 162557.

References: (1) Moore, P.B. and J. Ito (1979) Alluaudites, wyllieites, arrojadites: crystal
chemistry and nomenclature. *Mineral. Mag.*, 43, 227–235. (2) (1980) *Amer. Mineral.*, 65, 810–811
(abs. ref. 1). (3) Fransolet, A.-M. (1995) Wyllieite et rosemaryite dans la pegmatite de Buranga,
Rwanda. *Eur. J. Mineral.*, 7, 567–575 (in French with English abs.).

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