

**Willhendersonite****KCaAl<sub>3</sub>Si<sub>3</sub>O<sub>12</sub>•5H<sub>2</sub>O**

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**Crystal Data:** Triclinic. *Point Group:*  $\bar{1}$ . As tabular crystals, flattened on {001}, with {100}, {010}, and {001}, and as trellislike twinned aggregates, to < 1 mm. *Twinning:* Complex, by rotation about [111]; reflection across (001); by rotation about  $[\bar{1}10]$  or reflection across (110).

**Physical Properties:** *Cleavage:* Perfect on {100}, {010}, and {001}. *Tenacity:* Brittle. Hardness = ~3 D(meas.) = 2.10–2.18 D(calc.) = 2.20

**Optical Properties:** Transparent. *Color:* Colorless. *Luster:* Vitreous. *Optical Class:* Biaxial (+) or (-).  $\alpha = 1.505(3)$   $\beta = 1.511(3)$   $\gamma = 1.517(3)$   $2V(\text{meas.}) = 87(3)^\circ$

**Cell Data:** *Space Group:*  $P\bar{1}$ .  $a = 9.206(2)$   $b = 9.216(2)$   $c = 9.500(4)$   $\alpha = 92.34(3)^\circ$   $\beta = 92.70(3)^\circ$   $\gamma = 90.12(3)^\circ$   $Z = 2$

**X-ray Powder Pattern:** San Venanzo quarry, Italy. 9.16 (100), 2.907 (60), 2.804 (50), 4.09 (40), 5.18 (30), 3.71 (30), 3.93 (20)

Chemistry:	(1)	(2)
SiO <sub>2</sub>	35.5	34.8
Al <sub>2</sub> O <sub>3</sub>	30.1	28.1
CaO	11.6	10.7
Na <sub>2</sub> O		trace
K <sub>2</sub> O	6.8	8.0
H <sub>2</sub> O	[16.0]	[18.4]
Total	[100.0]	[100.0]

(1) Ettringer Bellerberg volcano, Germany; by electron microprobe, H<sub>2</sub>O by difference; corresponds to K<sub>0.73</sub>Ca<sub>1.03</sub>Al<sub>3</sub>Si<sub>3</sub>O<sub>12</sub>•4.5H<sub>2</sub>O. (2) San Venanzo quarry, Italy; by electron microprobe, H<sub>2</sub>O by difference; corresponds to K<sub>0.90</sub>Ca<sub>1.01</sub>Al<sub>2.93</sub>Si<sub>3.08</sub>O<sub>12</sub>•5.4H<sub>2</sub>O.

**Mineral Group:** Zeolite group.

**Occurrence:** A secondary mineral formed by low-temperature hydrothermal alteration of potassic basaltic lavas (San Venanzo quarry, Italy); by contact metasomatism of limestone xenoliths in basalts (Ettringer Bellerberg volcano, Germany).

**Association:** Phillipsite, thomsonite, apophyllite, melilite (San Venanzo quarry, Italy); gismondine, chabazite, ettringite, thaumasite, phillipsite, thomsonite (Ettringer Bellerberg volcano, Germany).

**Distribution:** In the Vispi quarry, near San Venanzo, Umbria, Italy. In Germany, at the Ettringer Bellerberg volcano, near Mayen, Eifel district, Germany. From the Stradnerkogel, near Wilhelmsdorf, Styria, Austria.

**Name:** For Dr. William A. Henderson, Jr. of Stamford, Connecticut, USA.

**Type Material:** Harvard University, Cambridge, Massachusetts, 119472; National Museum of Natural History, Washington, D.C., USA, 148655, 148656.

**References:** (1) Peacor, D.R., P.J. Dunn, W.B. Simmons, E. Tillmanns, and R.X. Fischer (1984) Willhendersonite, a new zeolite isostructural with chabazite. *Amer. Mineral.*, 69, 186–189. (2) Tillmanns, E., R.X. Fischer, and W.H. Baur (1984) Chabazite-type framework in the new zeolite willhendersonite, KCaAl<sub>3</sub>Si<sub>3</sub>O<sub>12</sub>•5H<sub>2</sub>O. *Neues Jahrb. Mineral., Monatsh.*, 547–558.