

**Englishite****K<sub>3</sub>Na<sub>2</sub>Ca<sub>10</sub>Al<sub>15</sub>(PO<sub>4</sub>)<sub>21</sub>(OH)<sub>7</sub>•26H<sub>2</sub>O**

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**Crystal Data:** Monoclinic. *Point Group:* 2/*m* or *m*. As plates, in subparallel aggregates, in crusts to 1 mm thick; as friable masses.

**Physical Properties:** *Cleavage:* On {001}, perfect, micaceous. *Tenacity:* Flexible. Hardness = ~3 D(meas.) = 2.65–2.68 D(calc.) = 2.69

**Optical Properties:** Transparent. *Color:* White to colorless, grayish green; colorless in transmitted light. *Luster:* Vitreous, pearly on cleavages. *Optical Class:* Biaxial (-). *Orientation:* X = c; Y ≈ a; Z ≈ b. α = 1.570(5) β = 1.572(5) γ = 1.573(5) 2V(meas.) = Small.

**Cell Data:** *Space Group:* A2/a or Aa. a = 38.43(2) b = 11.86 c = 20.67 β = 111°16' Z = 4

**X-ray Powder Pattern:** Fairfield, Utah, USA. 8.94 (10), 17.66 (9), 2.84 (8), 5.57 (6), 2.96 (6), 2.68 (6), 1.71 (5)

<b>Chemistry:</b>	(1)	(2)	(3)
P <sub>2</sub> O <sub>5</sub>	41.6	41.0	41.97
Al <sub>2</sub> O <sub>3</sub>	21.5	21.8	21.54
FeO	0.0	2.5	
MgO	0.1	0.1	
CaO	15.5	15.8	15.79
Na <sub>2</sub> O	1.6	0.9	1.75
K <sub>2</sub> O	4.0	3.6	3.98
H <sub>2</sub> O	15.1	[14.9]	14.97
Total	99.4	[100.6]	100.00

(1) Little Green Monster mine, Utah, USA; by electron microprobe, H<sub>2</sub>O by the Penfield method, average of three analyses; corresponds to K<sub>3.01</sub>Na<sub>1.83</sub>(Ca<sub>9.79</sub>Mg<sub>0.09</sub>)<sub>Σ=9.88</sub>Al<sub>14.94</sub>(PO<sub>4</sub>)<sub>20.77</sub>(OH)<sub>7.11</sub>•26.14H<sub>2</sub>O. (2) Tip Top mine, South Dakota, USA; by electron microprobe, H<sub>2</sub>O from stoichiometry. (3) K<sub>3</sub>Na<sub>2</sub>Ca<sub>10</sub>Al<sub>15</sub>(PO<sub>4</sub>)<sub>21</sub>(OH)<sub>7</sub>•26H<sub>2</sub>O.

**Occurrence:** In variscite nodules (Little Green Monster mine, Utah, USA); in a complex granite pegmatite (Tip Top mine, South Dakota, USA).

**Association:** Variscite, montgomeryite, wardite, millisite, crandallite (Little Green Monster mine, Utah, USA); montgomeryite, eosphorite–childrenite, tiptopite, roscherite, pahasapaite, parafransoletite, robertsite, mitridatite, whitlockite (Tip Top mine, South Dakota, USA).

**Distribution:** In the USA, from the Little Green Monster mine, Clay Canyon, about nine km west of Fairfield, Utah Co., Utah; in the Tip Top mine, 8.5 km southwest of Custer, Custer Co., South Dakota; at the Gold Quarry mine, near Carlin, Maggie Creek district, Eureka Co., the Mickle mine, Lynn district, Elko Co., and the Redhouse barite mine, Potosi district, Humboldt Co., Nevada.

**Name:** To honor George Letchworth English (1864–1944), New York City, New York, USA, American mineral dealer and collector.

**Type Material:** Harvard University, Cambridge, Massachusetts, USA, 95494.

**References:** (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 957–958. (2) Dunn, P.J., R.C. Rouse, and J.A. Nelen (1984) Englishite: new chemical data and a second occurrence from the Tip Top pegmatite, Custer, South Dakota. *Can. Mineral.*, 22, 469–470. (3) Moore, P.B. (1976) Derivative structures based on the alunite octahedral sheet: mitridatite and englishite. *Mineral. Mag.*, 40, 863–866.

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