## Childrenite $Fe^{2+}Al(PO_4)(OH)_2 \cdot H_2O$



**Crystal Data:** Orthorhombic; probably monoclinic, pseudo-orthorhombic. *Point Group:* $2/m$ $2/m$ $2/m$. As equant to pyramidal crystals, may be short prismatic along [001], thick tabular on {010}, or platy on {100}, commonly doubly terminated, to 2 cm; in radiating groups and fibrous crusts; massive. *Twinning:* May show twinning on {100} and {001}, observed optically, to give pseudo-orthorhombic symmetry; may be due to oxidation.

**Physical Properties:** *Cleavage:* {100}, poor. *Fracture:* Subconchoidal to uneven. Hardness = 5 D(meas.) = 3.11–3.19 D(calc.) = 3.12–3.15

**Optical Properties:** Transparent to translucent. *Color:* Yellowish brown to brown, clove-brown. *Streak:* White. *Luster:* Vitreous to resinous.
*Optical Class:* Biaxial (–). *Pleochroism:* $X$ = yellow; $Y$ = pink; $Z$ = pale pink to colorless. *Orientation:* $X = b$; $Y = a$; $Z = c$; $Y \wedge c = 4°$–$8°$ in optically twinned individuals. *Dispersion:* $r > v$, strong, for near end-member composition. $\alpha = 1.644$–$1.649$ $\beta = 1.662$–$1.683$ $\gamma = 1.671$–$1.691$ 2V(meas.) = 50° in optically twinned crystals.

**Cell Data:** *Space Group: Bba*2. $a = 10.395(1)$ $b = 13.394(1)$ $c = 6.918(1)$ Z = 8

**X-ray Powder Pattern:** Stari Trg mine, Serbia.
2.816 (100), 6.71 (64), 2.419 (50), 1.521 (40), 5.197 (36), 3.528 (28), 4.362 (22)

**Chemistry:**

| | (1) | (2) | | (1) | (2) |
|---|---|---|---|---|---|
| $P_2O_5$ | 29.92 | 30.88 | CaO | 0.65 | |
| $Al_2O_3$ | 21.43 | 22.18 | $Na_2O$ | 0.37 | |
| FeO | 28.56 | 31.26 | $H_2O$ | 15.80 | 15.68 |
| MnO | 3.11 | | Total | 99.84 | 100.00 |

(1) Crinnis and Carlyon mine, Cornwall, England. (2) $FeAl(PO_4)(OH)_2 \cdot H_2O$.

**Polymorphism & Series:** Forms a series with eosphorite.

**Occurrence:** In some complex granite pegmatites, typically a low-temperature hydrothermal alteration product of primary phosphate minerals.

**Association:** Siderite, pyrite, apatite, quartz (Tavistock, England); zinnwaldite, tourmaline, apatite, kaolinite (Greifensteine, Germany).

**Distribution:** In England, from Devon, near Tavistock, at Wheal Crebor, the George and Charlotte mine, Russell United mines, Wheal Betsy, and many other places; from Cornwall, in the Crinnis and Carlyon mine, Wheal Jane, and elsewhere; from the Cobalt mine, Scar Crag, Causey Pike, Keswick, Cumbria. On the Greifensteine, near Ehrenfriedersdorf, Saxony, and Hagendorf, Bavaria. In the Stari Trg mine (Trepča), Kosovo, Serbia. At the Fram pegmatite, Kamativi, and the Kondo pegmatite, Miami, Zimbabwe. In the USA, in the Palermo #1 mine, near North Groton, Grafton Co., New Hampshire. From the Rapid Creek–Big Fish River area, Yukon Territory, Canada. Large crystals at the João Modesto dos Santos mine, and from a number of other mines around Linópolis and Mendes Pimental, Minas Gerais, Brazil. At the Siglo XX mine, Llallagua, Potosí, Bolivia. In the Moculta phosphate quarry, northeast of Angaston, South Australia. Other localities are known; the Fe:Mn ratio however should be confirmed.

**Name:** In honor of John George Children (1777–1852), English chemist and mineralogist.

**References:** (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 936–939. (2) Hurlbut, C. (1950) Childrenite-eosphorite series. Amer. Mineral., 35, 793–805. (3) Braithwaite, R.S.W. and B.V. Cooper (1982) Childrenite in south-west England. Mineral. Mag., 46, 119–126. (4) Giuseppetti, G. and C. Tadini (1984) The crystal structure of childrenite from Tavistock (SW England), $Ch_{89}Eo_{11}$ term of childrenite–eosphorite series. Neues Jahrb. Mineral., Monatsh., 263–271. (5) Bermanec, V., S. Šćavničar, and V. Zebec (1995) Childrenite and crandallite from the Stari Trg mine (Trepča), Kosovo: new data. Mineral. Petrol., 52, 197–208.