Wooldridgeite $Na_2CaCu_2(P_2O_7)_2 \cdot 10H_2O$

Crystal Data: Orthorhombic. *Point Group:* $mm2$. As equant rhombic-dipyramidal crystals, typically with curved faces, to 200 μm, isolated and in aggregates.

Physical Properties: *Fracture:* Irregular. *Tenacity:* Brittle. Hardness = 2–3
D(meas.) = n.d. D(calc.) = 2.279

Optical Properties: Transparent. *Color:* Pale blue-green; colorless in transmitted light.
Streak: Very pale blue-green. *Luster:* Vitreous.
Optical Class: Biaxial (–) [*sic*]. *Orientation:* $X = b$; $Y = c$; $Z = a$. $\alpha = 1.508(1)$ $\beta = 1.511(1)$ $\gamma = 1.517(1)$ $2V(meas.) = 76.2(5)^\circ$ $2V(calc.) = 71(10)^\circ$

Cell Data: *Space Group:* $Fdd2$. $a = 11.938(1)$ $b = 32.854(2)$ $c = 11.017(1)$ $Z = 8$

X-ray Powder Pattern: Judkins quarry, Warwickshire, England.
6.52 (100), 4.05 (40), 3.255 (40), 2.924 (40), 8.23 (30), 2.807 (25), 2.614 (20)

Chemistry:

	(1)	(2)
P_2O_5	39.37	38.30
CuO	20.24	21.46
MgO	0.24	
CaO	7.73	7.57
Na_2O	8.33	8.36
K_2O	0.17	
H_2O	[24.72]	24.31
Total	[100.80]	100.00

(1) Judkins quarry, Warwickshire, England; by electron microprobe, average of 10 analyses, presence of H_2O confirmed by IR and calculated from the structure analysis; corresponds to $(Na_{1.96}K_{0.03})_{\Sigma=1.99}Ca_{1.00}(Cu_{1.85}Mg_{0.04})_{\Sigma=1.89}(P_{2.02}O_7)_2 \cdot 10H_2O$. (2) $Na_2CaCu_2(P_2O_7)_2 \cdot 10H_2O$.

Occurrence: A rare weathering product of primary sulfides, the source of phosphorus enigmatic.

Association: Calcite, chalcopyrite, bornite, barite.

Distribution: From the Judkins quarry, Nuneaton, Warwickshire, England.

Name: Honoring James Wooldridge (1923–1995), amateur mineralogist and gemologist, who discovered the mineral.

Type Material: Manchester Museum, Manchester, England, N13200.

References: (1) Hawthorne, F.C., M.A. Cooper, D.I. Green, R.E. Starkey, A.C. Roberts, and J.D. Grice (1999) Wooldridgeite, $Na_2CaCu_2^{2+}(P_2O_7)_2(H_2O)_{10}$: a new mineral from Judkins Quarry, Warwickshire, England. Mineral. Mag., 63, 13–16. (2) (1999) Amer. Mineral., 84, 1466 (abs. ref. 1). (3) Cooper, M.A. and F.C. Hawthorne (1999) The crystal structure of wooldridgeite, $Na_2CaCu_2^{2+}(P_2O_7)_2(H_2O)_{10}$, a novel copper pyrophosphate mineral. Can. Mineral., 37, 73–81.