Sodium meta-autunite $Na_2(UO_2)_2(PO_4)_2 \cdot (6-8)H_2O$

Crystal Data: Tetragonal. *Point Group:* $4/m\ 2/m\ 2/m$. Platy crystals, to 5 mm, may be in radiating and foliated masses.

Physical Properties: *Cleavage:* {001}, perfect; {100}, less perfect. *Tenacity:* Brittle. Hardness = 2–2.5 D(meas.) = n.d. D(calc.) = [3.62] Yellow-green fluorescence under UV. Radioactive.

Optical Properties: Semitransparent. *Color:* Lemon-yellow, lettuce-yellow, greenish yellow. *Luster:* Vitreous, pearly on {001}.
Optical Class: Uniaxial (–). *Pleochroism:* Weak; O = light yellow; E = pale yellow. $\omega = 1.578$ $\epsilon = 1.559$

Cell Data: *Space Group:* $P4/nmm$. $a = 6.97$ $c = 8.69$ Z = 1

X-ray Powder Pattern: Kuruk deposit, Tajikistan.
3.67 (10), 2.675 (8), 1.566 (8b), 1.540 (8b), 3.23 (7), 1.639 (7), 1.364 (7)

Chemistry:

	(1)	(2)	(3)
UO_3	61.9	62.53	62.17
P_2O_5	15.56	14.69	15.43
CO_2	0.24		
SiO_2	1.6		
Al_2O_3	0.32		
Fe_2O_3	0.97		
MgO	0.43		
CaO	1.2	0.14	
Na_2O	5.62	6.88	6.74
H_2O^+	4.05		
H_2O^-	9.02		
H_2O		14.84	15.66
Total	100.91	99.08	100.00

(1) Kuruk deposit, Tajikistan; after deduction of impurities, stated to correspond to $(Na, Ca)_{\Sigma=2.04}(UO_2)_{1.91}(PO_4)_{2.00} \cdot 6.66H_2O$. (2) Do.; corresponds to $(Na, Ca)_{\Sigma=2.12}(UO_2)_{2.1}(PO_4)_{2.00} \cdot 7.9H_2O$. (3) $Na_2(UO_2)_2(PO_4)_2 \cdot 8H_2O$.

Mineral Group: Autunite group.

Occurrence: In the oxidized zone of a uranium deposit in a granodiorite massif.

Association: Schoepite, gypsum, kaolinite, "limonite".

Distribution: Found in the Kuruk uranium deposit, 15 km northeast of Khodzhent, Samgar Steppe, northern Tajikistan.

Name: The prefix *meta* indicates the dehydration product of *"sodium autunite"*, the transitory sodium analog of *meta-autunite*.

Type Material: A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, 67809–67812.

References: (1) Chernikov, A.A., O.V. Krutetskaya, and N.I. Organova (1957) Sodium-autunite [sodium meta-autunite]. Atomnaya Energiya, 3, 133–140 (in Russian). (2) (1958) Amer. Mineral., 43, 383 (abs. ref. 1). (3) Chernikov, A.A. and N.I. Organova (1994) Sodium autunite and sodium meta-autunite. Doklady Acad. Nauk SSSR, 338, 368–371 (in Russian). (4) (1995) Amer. Mineral., 80, 1329–1330 (abs. ref. 3 with discussion of nomenclature). (5) Pekov, I.V. (1998) Minerals first discovered on the territory of the former Soviet Union, 190–191.