Surkhobite $(Ba, K)_2CaNa(Mn, Fe^{2+}, Fe^{3+})_8Ti_4(Si_2O_7)_4O_4(F, OH, O)_6$

Crystal Data: Monoclinic. *Point Group*: 2. As poorly formed platy crystals, to 1 mm, dominated by {001} and as grains, to 2 cm. *Twinning*: Microscopic twins on (001).

Physical Properties: *Cleavage*: Perfect {001}. *Fracture*: Uneven. *Tenacity*: Brittle.
Hardness = 4.5 VHN = 482 on {001}, 250 perpendicular to {001} (20-30 g load).
D(meas.) = 3.84(10) D(calc.) = 3.98

Optical Properties: Translucent. *Color*: Brownish red. *Streak*: White. *Luster*: Vitreous.
Optical Class: Biaxial (-). $\alpha = 1.790$ (calculated from 2V) $\beta = 1.858(10)$ $\gamma = 1.888(10)$
2V = 65(5)° *Orientation*: $X = b$; $Z \wedge a = 34°$. *Dispersion:* $r < v$, strong.
Pleochroism: Y = orange; Z = bright yellow; X = yellow. Absorption: $Y > Z \geq X$.

Cell Data: *Space Group*: $C2$. $a = 10.723(1)$ $b = 13.826(2)$ $c = 20.791(4)$ $\beta = 95.00(1)°$
$Z = 4$

X-ray Powder Pattern: Dara-i-Pioz massif, Tajikistan.
3.454 (100), 2.592 (70), 2.074 (40), 10.39 (20), 3.186 (15), 2.862 (15), 1.728 (15)

Chemistry:

	(1)
Na_2O	2.27
K_2O	1.87
CaO	2.53
SrO	0.26
BaO	11.16
MgO	0.13
MnO	16.32
FeO	13.92
Fe_2O_3	2.11
Al_2O_3	0.02
SiO_2	27.17
TiO_2	16.14
Nb_2O_5	2.14
ZrO_2	0.34
F	2.94
H_2O	1.17
$-O = F_2$	1.24
Total	99.25

(1) Dara-i-Pioz massif, Tajikistan; electron microprobe and Mössbauer analysis, water by Penfield method, corresponding to $Na_{2.60}K_{1.41}Ca_{1.60}Sr_{0.09}Ba_{2.58}(Mn_{8.17}Fe^{2+}_{6.88}Fe^{3+}_{0.94}Mg_{0.115}Al_{0.01})_{\Sigma=16.115}(Ti_{7.17}Nb_{0.57}Zr_{0.10})_{\Sigma=7.84}Si_{16.06}H_{4.61}F_{5.49}O_{70.51}$.

Occurrence: In a zoned alkaline syenite pegmatite replacing astrophyllite and bafertisite.

Association: Aegirine, microcline, albite, quartz, amphibole, annite, bafertisite, astrophyllite, zircon, fluorite, polylithionite, stillwelite, sogdianite, tadjikite.

Distribution: Dara-i-Pioz massif, central Tajikistan.

Name: For the Surkhob river, in the basin of which the first specimens were collected.

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

References: (1) Rastsvetaeva, R.K., E.M. Eskova, V. D. Dusmatov, N.V. Chukanov, and F. Schneider (2008) Surkhobite: revalidation and redefinition with the new formula, $(Ba,K)_2CaNa(Mn,Fe^{2+},Fe^{3+})_8Ti_4(Si_2O_7)_4O_4(F,OH,O)_6$. Eur. J. Mineral., 20, 289–295. (2) (2009) Amer. Mineral., 94, 404 (abs. ref. 1). (3) (2004) Amer. Mineral., 89, 469-470.