Tazheranite $(Zr, Ti, Ca)(O, \square)_2$

Crystal Data: Cubic. *Point Group*: $4/m\ \bar{3}\ 2/m$. Anhedral crystals, thick tabular, may be rounded, to 1.5 mm, and as irregular grains.

Physical Properties: *Fracture*: Conchoidal. *Tenacity*: Brittle. Hardness = 7.5 D(meas.) = 5.01(2) D(calc.) = 4.9

Optical Properties: Semitransparent. *Color*: Yellowish orange to reddish orange, rarely cherry-red, then zoned, brownish green; in thin section, pale yellow, zoned with a reddish tint.
Luster: Adamantine to greasy on fractures.
Optical Class: Isotropic; may exhibit weak to strong anisotropism, centrally zoned. n = 2.25(2)

Cell Data: *Space Group*: $Fm\bar{3}\ m$. a = 5.111(1) Z = 4

X-ray Powder Pattern: Tazheran massif, Russia.
2.94 (10), 1.804 (10), 1.539 (10), 2.55 (6), 1.171 (5), 1.044 (5), 0.9828 (5)

Chemistry:	(1)	(2)		(1)	(2)
SiO_2	0.63		Cr_2O_3		0.02
TiO_2	2.42	4.84	Sc_2O_3		15.23
ZrO_2	67.67	68.42	Y_2O_3		2.12
Ti_2O_3	11.65		HfO_2		1.34
Al_2O_3	4.61	0.45	MgO	2.38	
Fe_2O_3	0.92		CaO	9.97	6.52
FeO		0.87	Total	100.25	100.04
V_2O_3		0.23			

(1) Tazheran massif, Russia; after deduction of spinel 5.41% and forsterite 1.48%, corresponds to $(Zr_{0.59}Ca_{0.19}Ti^{3+}_{0.18}Ti^{4+}_{0.03}Al_{0.02}Fe_{0.02})_{\Sigma=1.03}O_{1.74}$. (2) Allende meteorite; by electron microprobe; corresponds to $(Zr_{0.55}Sc_{0.22}Ca_{0.12}Ti_{0.06}Y_{0.02}Hf_{0.01}Fe_{0.01}Al_{0.01})_{\Sigma=1.00}O_{1.75}$.

Occurrence: In calciphyres banding periclase-brucite marble xenoliths in an alkalic massif (Tazheran massif, Russia). In a CV3 carbonaceous chondrite meteorite.

Association: Spinel, forsterite, åkermanite-gehlenite, clinohumite, ludwigite, azoproite, magnesioferrite, calzirtite, baddeleyite, geikielite, perovskite, rutile, zircon, dolomite, calcite (Tazheran massif, Russia). Allendeite, perovskite (Allende meteorite).

Distribution: In the Tazheran alkalic massif, west of Lake Baikal, eastern Siberia, Russia. On Alnö Island, Sweden. From the Jacupiranga carbonatite, São Paulo, Brazil. In the Allende meteorite.

Name: For the *Tazheran* massif, Russia, where it was first noted.

Type Material: Mining Institute, St. Petersburg, 1094/1; A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, 72602, vis5748; National Museum of Natural History, Washington, D.C., USA, 145796.

References: (1) Konev, A.A., Z.F. Ushchapovskaya, A.A. Kashaev, and V.S. Lebedeva (1969) Tazheranite, a new calcium-titanium-zirconium mineral. Doklady Acad. Nauk SSSR, 186, 917-920 (in Russian). (2) (1970) Amer. Mineral., 55, 318 (abs. ref. 1). (3) Kashaev, A.A. and Z.F. Ushchapovskaya (1969) Tazheranite - a mineral with CaF_2-type structure. Kristallografiya (Sov. Phys. Crystal.), 14, 1064-1065 (in Russian). (4) Rastsvetaeva, R.K., D.Yu. Pushcharovskii, E.M. Spiridonov, and V.M. Gekimyants (1998) Tazheranite and calzirtite: structural-mineralogical similarity and distinction. Doklady Akad. Nauk, 359(4), 529-531 (in Russian). (5) (1999) Amer. Mineral., 84, 1688 (abs. ref. 4). (6) Ma, C., J.R. Beckett, and G.R. Rossman (2014) Allendeite ($Sc_4Zr_3O_{12}$) and hexamolybdenum (Mo,Ru,Fe), two new minerals from an ultrarefractory inclusion from the Allende meteorite. Amer. Mineral., 99, 654-666 [occurrence reference].