Zirconolite CaZrTi$_2$O$_7$

Crystal Data: Monoclinic; hexagonal; orthorhombic; commonly metamict. Point Group: 2/m; 2/m 2/m 2/m. Crystals, typically prismatic, elongated along [001], to 5 cm; polytypes are commonly intergrown. Twinning: Polysynthetic.


Optical Properties:Opaque, transparent in thin fragments. Color: Brown to black; yellowish or brownish in thin section. Streak: Brownish yellow to dark brown. Luster: Submetallic; adamantine to greasy. Optical Class: Isotropic. n = 2.06–2.17; 2.215 ("polym ignyte").

Cell Data: Space Group: C2/c or Cc (2M), with a = 12.431(1) b = 7.224(1) c = 11.483(3) β = 100.33(1)° Z = 8, or Space Group: P3$_1$21 (3T), with a = 16.886(9) c = 3.278(3) Z = [8] Zirconolite, Russia; after heating at 1000 °C for two hours; polytypes cannot be distinguished by powder X-ray methods.

X-ray Powder Pattern: Afrikanda massif, Russia; by electron microprobe, corresponding to (Ca$_{0.85}$Th$_{0.05}$U$_{0.02}$Zr$_{1.08}$Ti$_{1.08}$Nb$_{0.45}$Fe$_{3+}$Fe$_{2+}$Fe$_{0.09}$Al$_{0.08}$Mg$_{0.04}$)Σ=0.95 (Ti$_{1.53}$Fe$_{0.27}$Nb$_{0.09}$Al$_{0.08}$Mg$_{0.04}$)Σ=2.01 (Ca$_{11.05}$Na$_{12.5}$Mg$_{0.45}$Ca$_{0.01}$)Σ=0.98 Σ=2.01 Σ=2.01 O$_7$. (2) Kaiserstuhl, Germany; by electron microprobe, corresponding to (Ca$_{0.85}$Th$_{0.06}$U$_{0.02}$RE$_{0.02}$)Σ=0.95 Zr$_{1.08}$Ti$_{1.08}$Nb$_{0.45}$Fe$_{0.25}$Fe$_{0.12}$Mn$_{0.01}$Σ=1.91 O$_7$.

Polymorphism & Series: Polytypoids 2M, 3T, 3O are known.

Occurrence: In alkaline rocks, as carbonatites, kimberlites, syenites, sanidinites; more rarely in ultramafic rocks; in felsic pegmatite in gabbro; a detrital mineral.

Association: Apatite, clinohumite, phlogopite, richterite, pyrochlore, baddeleyite, perovskite, titanite, pyrrhotite, calcite.

Distribution: In the Afrikanda pyroxenite massif, Kola Peninsula, Russia. At Fredriksværn, and Agnes Sandefjord, Vestfold, Norway. In the Kaiserstuhl carbonatite, Baden-Württemberg, Germany. From Monte di Procida, Campi Flegrei, Campania, Italy. In the Laouni intrusive, 250 km south of Tamanrasset, Algeria. In Sri Lanka, from Walaweduwa; in the Alupola stream, Bambabarabotuwa district; and elsewhere in Sabaragamuwa Province. In some basalt samples from the Moon.

Name: As a ZIRCONium-bearing mineral.

Type Material: A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, 59249–59251, vis6008, vis6012, vis6018.

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