Sharyginite $Ca_3TiFe_2O_8$

Crystal Data: Orthorhombic. *Point Group*: *mm*2. As crystals to 200 μm, flattened on {010} and displaying {100}, {001} and, rarely a rhombic pyramid.

Physical Properties: *Cleavage*: Good on {010}; imperfect on {001} and {100}. *Fracture*: Uneven. *Tenacity*: Brittle. VHN = 621-649, 635 average (25 g load). Hardness = ~5.5-6 D(calc.) = 3.943

Optical Properties: Opaque. *Color*: Dark brown; light gray with rare yellowish brown internal reflections in reflected light. S*treak*: Brown. *Luster*: Sub-metallic.
Optical Class: *Pleochroism*: Weak, gray to very light gray. Weakly anisotropic.
R_1-R_2: (400) 18.7-17.6, (420) 18.3-17.4, (440) 17.0-16.0, (460) 16.4-15.6, (470) 16.1-15.5, (480) 15.9-15.4, (500) 15.5-14.9, (520) 15.2-14.5, (540) 15.0-14.3, (546) 14.9-14.2, (560) 14.8-14.2, (580) 14.7-14.1, (589) 14.6-14.1, (600) 14.6-14.1, (620) 14.6-14.0, (640) 14.6-14.0, (650) 14.5-13.9, (660) 14.4-13.7, (680) 14.3-13.5, (700) 14.1-13.4

Cell Data: Space Group: $P2_1ma$. a = 5.423(2) b = 11.150(8) c = 5.528(2) Z = 2

X-ray Powder Pattern: Bellerberg volcano lava field, Caspar quarry, Eifel, Germany.
2.679 (100), 1.936 (36), 2.763 (32), 2.712 (27), 1.857 (19), 1.580 (18), 1.559 (12)

Chemistry:	(1)	(2)		(1)	(2)
MnO_2	2.27		Cr_2O_3	0.20	
SiO_2	0.58		Fe_2O_3	34.87	39.16
TiO_2	17.04	19.59	CaO	41.59	41.25
ZrO_2	0.27		MgO	0.13	.
Al_2O_3	2.49		Total	99.44	100.00

(1) Bellerberg volcano lava field, Caspar quarry, Eifel, Germany; average of 9 electron microprobe analyses supplemented by Raman spectroscopy; corresponds to $Ca_{3.00}(Fe^{3+}_{1.00}Ti^{4+}_{0.86}Mn^{4+}_{0.11}Zr_{0.01}Cr^{3+}_{0.01}Mg_{0.01})_{\Sigma=2.00}(Fe^{3+}_{0.76}Al_{0.20}Si_{0.04})_{\Sigma=1.00}O_8$. (2) $Ca_3TiFe_2O_8$.

Polymorphism & Series: Solid solution with shulamitite and Mn-analogue of sharyginite.

Mineral Group: Anion deficient perovskite group.

Occurrence: In thermally metamorphosed limestone xenoliths in alkali basalt (Germany and Austria) or ignimbite (North Caucasus), in pyrometamorphic rocks (Israel), and metacarbonate rocks in burned dumps from coal mining (Donetsk basin).

Association: Fluorellestadite, cuspidine, brownmillerite, rondorfite, larnite, chlormayenite-wadalite, rankinite, magnesioferrite, perovskite, fluorite.

Distribution: From the Bellerberg volcano lava field, Caspar quarry, Eifel, Rhineland-Palatinate, Germany; at Jabel Harmun, Israel; from the North Caucasus, Kabardino-Balkaria, Russia; at the Klöch Basalt quarry, Bad Radkersburg, Styria, Austria and from burned dumps in the Donetsk coal basin, Ukraine.

Name: Honors Victor Victorovich Sharygin (b.1964), Sobolev Institute of Geology and Mineralogy, Novosibirsk, Russia, for his contributions to the petrology of alkaline and pyrometamorphic rocks. He found and published preliminary data on this mineral.

Type Material: A.E. Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow, Russia (4958/1).

References: (1) Juroszek, R., H. Krüger, I. Galuskina, B. Krüger, L. Jeżak, B. Ternes, J. Wojdyla, T. Krzykawski, L. Pautov, and E. Galuskin (2018) Sharyginite, $Ca_3TiFe_2O_8$, a new mineral from the Bellerberg Volcano, Germany. Minerals 8(7), 308. (2) (2020) Amer. Mineral., 105(8), 1281-1282 (abs. ref. 1).