

Rudashevskyite, the Fe-dominant analogue of sphalerite, a new mineral: Description and crystal structure

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ABSTRACT

Rudashevskyite, Fe-dominant analogue of sphalerite, is an accessory phase in the Indarch meteorite (enstatite chondrite, EH4). It occurs as xenomorphic polycrystalline grains, 5–120 μm in size, associated with clinoenstatite, kamacite, troilite, oldhamite, niningerite, schreibersite, and roedderite. Macroscopically, rudashevskyite is black with resinous luster. In reflected light, it is gray with brownish tint. Isotropic, no internal reflections. Reflectance in air (% , λ): 19.5(400), 19.5(420), 19.5(440), 19.5(460), 19.6(470), 19.8(480), 19.8(500), 19.9(520), 20.2(540), 20.3(546), 20.5(560), 20.7(580), 20.8(589), 20.9(600), 20.9(620), 21.1(640), 21.1(650), 21.1(660), 21.1(680), and 21.2(700). Brittle. D_c 3.79 g/cm³. VHN 353 kg/mm². Chemical composition (electron microprobe, average of 31 analyses on 11 grains, wt%): Fe 37.1, Zn 24.7, Mn 2.4, Cu 0.4, S 35.3, total 99.9. Empirical formula (2 apfu): $(\text{Fe}_{0.61}\text{Zn}_{0.35}\text{Mn}_{0.04}\text{Cu}_{0.01})_{\Sigma=1.00}\text{S}_{1.00}$, ideally (Fe,Zn)S. Cubic, $F\bar{4}3m$, a 5.426(2) \AA , V 159.8 (2) \AA^3 , Z = 4. X-ray powder diffraction pattern (Debye-Scherrer, $\text{FeK}\alpha$), [$d(I)(hkl)$]: 3.130(100)(111), 2.714(10)(200), 1.919(50)(220), 1.634(40)(311), 1.359(5)(400), 1.246(30)(331), 1.107(30)(422), 1.045(30)(511, 333). Crystal structure: R_1 = 0.050 for 26 unique observed ($|F_o| \geq 4\sigma_F$) reflections. It is named in honor for N.S. Rudashevsky, St. Petersburg, Russia, for his contributions to the study of ore minerals.

Keywords: Rudashevskyite, new mineral, sphalerite, wurtzite, FeS, meteorite, enstatite chondrite, black smokers