

A new mineral species rosovskyite, $(\text{Fe}^{3+}, \text{Ta})(\text{Nb}, \text{Ti})\text{O}_4$: crystal chemistry and physical properties

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Abstract

© 2015, Springer-Verlag Berlin Heidelberg. A new mineral rosovskyite named after L.N. Rossovsky was discovered in granite pegmatites of the Bulgut occurrence, Altai Mts., Western Mongolia. Associated minerals are microcline, muscovite, quartz, albite, garnet of the almandine-spessartine series, beryl, apatite, triplite, zircon, pyrite, yttrrobetafite-(Y) and schorl. Rossovskyite forms flattened anhedral grains up to $6 \times 6 \times 2$ cm. The color of the mineral is black, and the streak is black as well. The luster is semi-metallic, dull. Mohs hardness is 6. No cleavage or parting is observed. Rossovskyite is brittle, with uneven fracture. The density measured by the hydrostatic weighing method is 6.06 g/cm^3 , and the density calculated from the empirical formula is 6.302 g/cm^3 . Rossovskyite is biaxial, and the color in reflection is gray to dark gray. The IR spectrum contains strong band at 567 cm^{-1} (with shoulders at 500 and 600 cm^{-1}) corresponding to cation-oxygen stretching vibrations and weak bands at 1093 and 1185 cm^{-1} assigned as overtones. The reflection spectrum in visible range is obtained. According to the Mössbauer spectrum, the ratio $\text{Fe}^{2+}:\text{Fe}^{3+}$ is 35.6:64.4. The chemical composition is as follows (electron microprobe, Fe apportioned between FeO and Fe_2O_3 based on Mössbauer data, wt%): MnO 1.68, FeO 5.92, Fe_2O_3 14.66, TiO_2 7.69, Nb_2O_5 26.59, Ta_2O_5 37.51, WO_3 5.61, total 99.66. The empirical formula calculated on four O atoms is: (Formula presented.) (Formula presented.) (Formula presented.) $\text{Ti}_{0.25}\text{Nb}_{0.51}\text{Ta}_{0.43}\text{W}_{0.06}\text{O}_4$. The crystal structure was determined using single-crystal X-ray diffraction data. The new mineral is monoclinic, space group $P2_1/c$, $a = 4.668(1)$, $b = 5.659(1)$, $c = 5.061(1) \text{ \AA}$, $\beta = 90.21(1)^\circ$; $V = 133.70(4) \text{ \AA}^3$, $Z = 2$. Topologically, the structure of rosovskyite is analogous to that of wolframite-group minerals. The crystal-chemical formula of rosovskyite is $[(\text{Fe}^{3+}, \text{Fe}^{2+}, \text{Mn})_{0.57}\text{Ta}_{0.32}\text{Nb}_{0.11}][\text{Nb}_{0.40}\text{Ti}_{0.25}\text{Fe}_{0.18}\text{Ta}_{0.11}\text{W}_{0.06}]\text{O}_4$. The strongest lines of the powder X-ray diffraction pattern [d , Å (I , %) (hkl)] are as follows: 3.604 (49) (110), 2.938 (100) ($-1-11$), 2.534 (23) (002), 2.476 (29) (021), 2.337 (27) (200), 1.718 (26) (-202), 1.698 (31) ($-2-21$), 1.440 (21) (-311). The type specimen of rosovskyite is deposited in the Mineralogical Museum of the Tomsk State University, Tomsk, 634050 Russia, with the inventory number 20927.

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Keywords

Granite-pegmatite, Mongolia, New mineral, Rossovskyite, Structure