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Yttriaite-(Y): The natural occurrence of Y_2O_3 from the Bol'shaya Pol'ya River, Subpolar Urals, Russia

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Abstract

Yttriaite-(Y), ideally Y_2O_3, is a new mineral (IMA2010-039) from the alluvial deposits of the Bol'shaya Pol'ya River, Subpolar Urals, Russia. The new mineral occurs as isolated crystals, typically cubo-octahedra <6 μm in size, embedded in massive native tungsten. Associated minerals include: copper, zircon, osmium, gold, and pyrite. The main forms observed are {100} and {111}. Due to the crystal size, physical properties could not be determined; however, the properties of synthetic Y_2O_3 are well known. Synthetic Y_2O_3 crystals are colorless to white with a white streak; crystals are transparent with an adamantine luster, while massive Y_2O_3 is typically translucent with an earthy luster. Synthetic Y_2O_3 has a Vickers hardness of 653.91, which corresponds to 5.5 on the Mohs scale. Synthetic Y_2O_3 crystals have good cleavage on {111}. Yttriaite-(Y) is isotropic; the refractive index measured at 587 nm on synthetic Y_2O_3 is $n = 1.931$. The empirical chemical formula (mean of 4 electron microprobe analyses) calculated on the basis of 3 O is: $Y_{1.98}Dy_{0.01}Yb_{0.01}O_3$. Yttriaite-(Y) is cubic, space group $Ia\bar{3}$, with parameters $a = 10.6018(7)$ Å, $V = 1191.62(7)$ Å^3, and $Z = 16$. The five strongest lines in the powder X-ray diffraction pattern (measured on synthetic Y_2O_3 using synchrotron radiation) are [d_{obs} in Å (*I*) (*hkl*)]: 3.0646 (100) (222), 1.8746 (55) (440), 1.5984 (38) (622), 2.6537 (26) (400), and 4.3356 (14) (211). The mineral name is based on the common name for the chemical compound, yttria.

Keywords: Yttriaite-(Y), new mineral, yttria, tungsten, Bol'shaya Pol'ya River, Subpolar Urals, Raman spectroscopy, electron back scatter diffraction