# Yttrialite-(Y) $(Y,Th)_2Si_2O_7$



**Crystal Data:** Monoclinic; commonly metamict. *Point Group:* $2/m$. Massive.

**Physical Properties:** *Cleavage:* Platy [*sic*]. *Tenacity:* Brittle. Hardness = 5–5.5 D(meas.) = 4.56–4.58 D(calc.) = 4.0 Radioactive.

**Optical Properties:** Translucent to nearly opaque. *Color:* Olive-green, becoming yellow-orange with alteration. *Luster:* Vitreous to greasy or dull.
*Optical Class:* Biaxial. $n = 1.760$, metamict. $\alpha = 1.749$ (synthetic $Y_2Si_2O_7$). $\beta = 1.751$–$1.758$ $\gamma = 1.754$ 2V(meas.) = n.d.

**Cell Data:** *Space Group:* $P2_1/m$ (synthetic $Y_2Si_2O_7$). $a = 7.50$ $b = 8.06$ $c = 5.02$ $\beta = 112.00°$ Z = 2

**X-ray Powder Pattern:** Baringer Hill, Texas, USA; after heating to 985 °C.
3.056 (100), 3.463 (80), 2.627 (70), 2.058 (65), 2.393 (60), 4.696 (50), 3.177 (40)

**Chemistry:**

| | (1) | (2) | | (1) | (2) |
|---|---|---|---|---|---|
| $SiO_2$ | 29.17 | 28.70 | FeO | 2.89 | |
| $ThO_2$ | 12.00 | 6.97 | MnO | 0.77 | 0.48 |
| $UO_2$ | 0.83 | 2.59 | PbO | 0.85 | |
| $Al_2O_3$ | 0.55 | | MgO | | 0.15 |
| $Y_2O_3$ | 46.50 | 31.37 | CaO | 0.60 | 0.93 |
| $Ce_2O_3$ | 1.86 | 0.66 | $H_2O$ | | 3.68 |
| $RE_2O_3$ | 2.94 | 23.47 | LOI | 0.79 | |
| $Fe_2O_3$ | | 1.18 | Total | 99.75 | 100.18 |

(1) Baringer Hill, Texas, USA. (2) Ivedal, Norway; $RE_2O_3 = La_2O_3$ 0.14%, $Pr_2O_3$ 0.15%, $Nd_2O_3$ 1.09%, $Sm_2O_3$ 1.17%, $Eu_2O_3$ 0.05%, $Gd_2O_3$ 2.44%, $Tb_2O_3$ 0.61%, $Dy_2O_3$ 5.35%, $Ho_2O_3$ 1.00%, $Er_2O_3$ 3.69%, $Tm_2O_3$ 0.75%, $Yb_2O_3$ 5.58%, $Lu_2O_3$ 1.45%.

**Occurrence:** A late-stage mineral in some rare-earth-bearing pegmatites.

**Association:** Gadolinite, thalenite, thortveitite, britholite-(Y), fergusonite, xenotime, allanite, microcline, albite, quartz, biotite, zircon, magnetite, spessartine, fluorite, tombarthite.

**Distribution:** In the USA, in Texas, from the Baringer Hill pegmatite, 26 km west of Burnet, and from Rode Ranch, near Bluffton, Llano Co., and in the Clear Creek pegmatite, Burnet Co. At Ivedal and Högetveit, Evje, Norway. From Åskagen, Vårmland, Sweden. At Fusamata and Suishoyama, Fukushima Prefecture; Yashima, Kagawa Prefecture; and Komenono, Ehime Prefecture, Japan.

**Name:** For the *yttrium* in its composition.

**References:** (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 512. (2) Omori, K. and S. Hasegawa (1953) Yttrialite and abukumalite from Iizaka Village, Fukushima Prefecture. Sci. Reports, Tohoku Univ., 4, 151–155. (3) (1953) Chem. Abs., 47, 8595 (abs. ref. 2). (4) Ito, J. and H. Johnson (1968) Synthesis and study of yttrialite. Amer. Mineral., 53, 1940–1952. (5) Nilssen, B. (1971) Yttrialite from Ivedal, Iveland, south Norway. Norsk. Geol. Tidsskr., 51, 1–8. (6) (1971) Mineral. Abs., 22, 290 (abs. ref. 5). (7) Batalieva, N.G. and Y.A. Pyatenko (1972) Artificial yttrialite ("y-phase") – a representative of a new structure type in the rare earth diorthosilicate series. Kristallografiya (Sov. Phys. Crystal.), 16, 905–910 (in Russian).