Grayite $ThPO_4 \cdot H_2O$

Crystal Data: Hexagonal. *Point Group:* 622. Quasi-pyramidal grains, to 2 mm; powdery.

Physical Properties: *Fracture:* Conchoidal. Hardness = 3–4 D(meas.) = 3.7–4.3 D(calc.) = [4.63] Radioactive. May fluoresce yellow-green under SW UV.

Optical Properties: Semitransparent. *Color:* Pale yellow, yellow, yellowish gray, reddish brown. *Luster:* Resinous to waxy.
Optical Class: Uniaxial, moderate birefringence. n = 1.66–1.69

Cell Data: *Space Group:* $P6_222$ (ICDD 42-1389). $a = 6.957(24)$ $c = 6.396(18)$ Z = 3

X-ray Powder Pattern: Gunnison, Colorado, USA; after heating to 800 °C, pattern is similar to monazite.
3.03 (vs), 2.82 (s), 2.15 (s), 4.35 (m), 1.856 (m), 6.05 (w), 3.46 (vw)

Chemistry: (1) Fremont Co., Wyoming, USA; semiquantitative spectrographic analysis shows Si and Th > 10%; Ca 7%, P and Al 3%, Fe and Mg 1.5%. The name is applied to a mineral with composition approximating $Th(PO_4)$ and showing a rhabdophane X-ray pattern, which changes to a monazitelike X-ray pattern on heating to 800 °C–900 °C.

Mineral Group: Rhabdophane group.

Occurrence: In a lithium-bearing pegmatite (Mtoko district, Zimbabwe); in an oxidized granitic vein in Precambrian rocks (Gunnison, Colorado, USA); in fracture fillings and disseminated through limestone (Fremont Co., Wyoming, USA).

Association: Thorite (Mtoko district, Zimbabwe); monazite-(Ce), xenotime-(Y), zircon (Havey quarries, Maine, USA).

Distribution: In the Gooddays mine, Mtoko district, and on the Mahaka and Verdale claims, Wedza district, Zimbabwe. From the Mungenyi pegmatite, about 65 km southwest of Mbarara, Ankole district, Uganda. In the USA, from southwest of Gunnison, Gunnison Co., Colorado; in Fremont Co., Wyoming; from the Zapot pegmatite, 25 km northeast of Hawthorne, Fitting district, Mineral Co., Nevada; at the Havey quarries, Topsham, Sagadahoc Co., Maine.

Name: In honor of Anton Gray, mining engineer, advisor to the United Kingdom Atomic Energy Authority.

Type Material: n.d.

References: (1) Bowie, S.H.U. (1957) Summary of progress for 1956, Geol. Surv. of Great Britain, 67 [introduces name]. (2) Dooley, J.R., Jr., and J.C. Hathaway (1961) Two occurrences of thorium-bearing minerals with rhabdophane-like structure. U.S. Geol. Survey Prof. Paper 424-C, 339–341. (3) (1962) Amer. Mineral., 47, 419–420 [discussion of grayite].