Haynesite $(UO_2)_3(Se^{4+}O_3)_2(OH)_2 \cdot 5H_2O$

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$ or $mm2$. Crystals are bladed, flattened on {010} and elongated along [001], to 3 mm; as divergent sprays and rosettes.

Physical Properties: *Cleavage:* On {010}, good. Hardness = 1.5–2 D(meas.) = 4.1 D(calc.) = 4.07 Radioactive; fluoresces yellowish green under SW UV.

Optical Properties: Transparent to translucent. *Color:* Amber-yellow; yellow in transmitted light. *Luster:* Vitreous.
Optical Class: Biaxial (–). *Pleochroism:* Strong; bright yellow to pale yellow. *Orientation:* $X = a$; $Y = b$; $Z = c$. $\alpha = 1.618(2)$ $\beta = 1.738(3)$ $\gamma = 1.765(5)$ 2V(meas.) = 45° 2V(calc.) = 48°

Cell Data: *Space Group:* $Pncm$ or $Pnc2$. $a = 8.025(5)$ $b = 17.43(1)$ $c = 6.935(3)$ Z = 2

X-ray Powder Pattern: Repete mine, Utah, USA.
8.01 (100), 2.912 (80), 4.01 (70), 3.119 (70), 3.468 (60), 3.186 (50), 2.471 (40)

Chemistry:

	(1)	(2)
UO_3	71.81	72.22
SeO_2	17.91	18.68
H_2O	8.56	9.10
Total	[98.28]	100.00

(1) Repete mine, Utah, USA; by electron microprobe, average of 12 analyses, C and H by CHN analyzer, recalculated after removal of CaO 0.85% and CO_2 1.51% as calcite; then corresponds to $(UO_2)_{3.08}(SeO_2)_{1.98}(OH)_{2.20} \cdot 4.72H_2O$. (2) $(UO_2)_3(SeO_3)_2(OH)_2 \cdot 5H_2O$.

Occurrence: Rare in an oxidized uranium deposit in mudstones and sandstones.

Association: Andersonite, boltwoodite, ferroselite, gypsum, barite, calcite.

Distribution: From the Repete mine, 34 km southeast of Blanding, San Juan Co., Utah, USA.

Name: Honors Patrick Eugene Haynes (1953-), American geologist, mineral collector and dealer, who found the first specimens.

Type Material: Royal Belgian Institute of Natural Sciences, Brussels, Belgium, RC3922.

References: (1) Deliens, M. and P. Piret (1991) La haynesite, sélénite hydraté d'uranyle, nouvelle espèce minérale de la Mine Repete, comté de San Juan, Utah. Can. Mineral., 29, 561–564 (in French with English abs.). (2) (1992) Amer. Mineral., 77, 447 (abs. ref. 1).