

# Ningyoite



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**Crystal Data:** Orthorhombic, pseudohexagonal. *Point Group:* 222 (probable). Acicular to elongated lozenge-shaped crystals, to 5  $\mu\text{m}$ ; may form star-shaped aggregates.

**Physical Properties:** *Tenacity:* Friable. Hardness = n.d.  $D(\text{meas.}) = > 3.30$   
 $D(\text{calc.}) = [4.70]$  Radioactive.

**Optical Properties:** Semitransparent. *Color:* Brownish green to brown.  
*Optical Class:* Biaxial; low birefringence. *Pleochroism:* Slight; X = pale brown. *Orientation:* Parallel extinction; positive elongation.  $n = 1.60-1.70$

**Cell Data:** *Space Group:*  $P222$  (probable).  $a = 6.78(3)$   $b = 12.10(5)$   $c = 6.38(3)$   
 $Z = 3$

**X-ray Powder Pattern:** Ningyo-Toge mine, Japan.  
3.02 (vsb), 2.81 (s), 2.13 (s), 4.33 (m), 3.38 (mb), 5.99 (wb), 3.45 (w)

## Chemistry:

	(1)
UO <sub>3</sub>	n.d.
P <sub>2</sub> O <sub>5</sub>	16.8
UO <sub>2</sub>	23.3
FeO	4.8
CaO	6.1
H <sub>2</sub> O <sup>+</sup>	7.4
H <sub>2</sub> O <sup>-</sup>	1.9
H <sub>2</sub> O	
C	2.3
insol.	30.9
Total	93.5

(1) Ningyo-Toge mine, Japan; RE  $\approx$  a few %, which may be included apatite, corresponds to  $\text{Ca}_{0.92}\text{U}_{0.73}\text{Fe}_{0.56}(\text{PO}_4)_2 \cdot 3.47\text{H}_2\text{O}$ .

**Mineral Group:** Rhabdophane group.

**Occurrence:** The principal uranium mineral, as coatings and filling cavities in carbonaceous conglomerate (Ningyo mine, Japan); in uranium deposits in organic-rich conglomerate-sandstone-mudstone (British Columbia, Canada).

**Association:** Pyrite, marcasite, sphalerite, apatite, chlorite, gypsum, quartz, hypersthene, feldspar, clay minerals (Ningyo mine, Japan); saléeite, autunite, uraninite (Okanagan district, Canada).

**Distribution:** From the Ningyo-Toge uranium mine, Tottori Prefecture, Japan. In the Tyee and Blizzard uranium deposits, 60 and 30 km southeast of Kelowna, Okanagan district, British Columbia, Canada. From the Dzhanthuar and Rudnoye uranium deposits, Auminzatau Mountains, central Kyzylkum region, Uzbekistan. At an undefined locality in the Czech Republic.

**Name:** For Ningyo Pass, Japan, where the mine in which the mineral was first found is located.

**Type Material:** The Natural History Museum, London, England, 1960,92; National Museum of Natural History, Washington, D.C., USA, 113822, 115885.

**References:** (1) Muto, T., R. Meyrowitz, A.M. Pommer, and T. Murano (1959) Ningyoite, a new uranous phosphate mineral from Japan. *Amer. Mineral.*, 44, 633-650. (2) Boyle, D.R., A.L. Littlejohn, A.C. Roberts, and D.M. Watson (1981) Ningyoite in uranium deposits of south-central British Columbia: first North American occurrence. *Can. Mineral.*, 19, 325-331.

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