

**Crystal Data:** Monoclinic or Orthorhombic. *Point Group:* 2/m or 2/m 2/m 2/m. As prismatic crystals, to 2 mm, with striations parallel to elongation; as grains to 0.5 mm, as aggregates to 9 mm. *Twinning:* Polysynthetic.

**Physical Properties:** Hardness = 5-5.5 VHN = 606-698 (100 g load). D(calc.) = 4.12

**Optical Properties:** Transparent. *Color:* Dark greenish brown, pale gray to dark bluish gray. *Streak:* Pale greenish brown. *Luster:* Adamantine. *Optical Class:* Biaxial(+). *n* = n.d. 2V(meas.) = n.d. *Pleochroism:* Strong, pale green to pale greenish brown (REE contents <1 wt. %), pale violet to greenish brown (REE contents 3-10 wt. %).

**Cell Data:** *Space Group:* P2<sub>1</sub>/a. *a* = 13.9830(10) *b* = 5.6722(9) *c* = 11.9960(10)  $\beta$  = 114.215(7)<sup>o</sup> *Z* = 2 or *Pbca* (probable). *a* = 14.0 *b* = 5.7 *c* = 21.9 *Z* = 4 (orthorhombic polymorph)

**X-ray Powder Pattern:** Ohmi region, central Japan.

3.06 (vvs), 3.00 (vs), 3.13 (s), 2.86 (s), 4.16 (m), 3.21 (m), 2.79 (m) (monoclinic polymorph)  
3.025 (vvs), 2.977 (vvs), 3.000 (s), 2.832 (s), 2.732 (s), 3.643 (w), 3.150 (w) (orthorhombic)

Chemistry:	(1)		(2)		
	(1)	(2)	(1)	(2)	
SiO <sub>2</sub>	22.58	22.04	SrO	34.32	28.24
TiO <sub>2</sub>	29.88	23.60	BaO	0.13	0.16
ZrO <sub>2</sub>	9.49	10.11	La <sub>2</sub> O <sub>3</sub>	0.00	2.73
Nb <sub>2</sub> O <sub>5</sub>	0.24	1.33	Ce <sub>2</sub> O <sub>3</sub>	0.38	4.81
Ta <sub>2</sub> O <sub>5</sub>	0.07	0.01	Pr <sub>2</sub> O <sub>3</sub>	0.10	0.63
Al <sub>2</sub> O <sub>3</sub>	0.20	1.70	Nd <sub>2</sub> O <sub>3</sub>	0.29	1.40
FeO	0.10	1.19	<u>Sm<sub>2</sub>O<sub>3</sub></u>	<u>0.04</u>	<u>0.06</u>
CaO	0.43	0.52	Total	98.25	98.53

(1) Ohmi region, central Japan; by electron microprobe, average of 6 analyses; corresponding to (Sr<sub>3.62</sub>Ca<sub>0.08</sub>Ce<sub>0.03</sub>Nd<sub>0.02</sub>Ba<sub>0.01</sub>Pr<sub>0.01</sub>) $\Sigma=3.76$ (Zr<sub>0.84</sub>Ti<sub>0.09</sub>Al<sub>0.04</sub>Fe<sub>0.02</sub>Nb<sub>0.02</sub>) $\Sigma=1.01$ Ti<sub>4.00</sub>Si<sub>4.11</sub>O<sub>22</sub>.

(2) Ohmi region, central Japan; by electron microprobe, average of 3 analyses; corresponding to (Sr<sub>3.06</sub>Ce<sub>0.33</sub>La<sub>0.19</sub>Ca<sub>0.10</sub>Nd<sub>0.09</sub>Pr<sub>0.04</sub>Ba<sub>0.01</sub>) $\Sigma=3.83$ Zr<sub>0.92</sub>(Ti<sub>3.31</sub>Al<sub>0.26</sub>Fe<sub>0.19</sub>Nb<sub>0.14</sub>Ta<sub>0.09</sub>) $\Sigma=3.99$ Si<sub>4.11</sub>O<sub>22</sub>.

**Polymorphism & Series:** Monoclinic and orthorhombic polymorphs.

**Mineral Group:** Perrierite group.

**Occurrence:** In jade pebbles from rocks in a high P/T metamorphic belt as tectonic inclusions in serpentinite melange. Orthorhombic polymorph occurs as domains to 5  $\mu$ m in monoclinic rengeite.

**Association:** Jadeite, natrolite, rutile, titanite, pectolite, itoigawaite.

**Distribution:** From the Oyashirazu shore, Sea of Japan, Ohmi Town; from the beds of the Kotakigawa and Himekawa rivers, Itoigawa City, Ohmi region, Niigata Prefecture, Japan.

**Name:** For Mt. *Renge* and the Renge metamorphic belt where jadeite deposits occur in Japan.

**Type Material:** In Japan, at the National Science Museum, Tokyo (NSM M-27921) and at the Fossa Magna Museum, Itoigawa, Niigata (FMM00715).

**References:** (1) Miyajima, H., S. Matsubara, R. Miyawaki, K. Yokoyama and, K. Hirokawa (2001) Rengeite, Sr<sub>4</sub>ZrTi<sub>4</sub>Si<sub>4</sub>O<sub>22</sub>, a new mineral, the Sr-Zr analogue of perrierite from the Itoigawa-Ohmi district, Niigata Prefecture, central Japan. *Mineral. Mag.*, 65, 111-120. (2) Miyawaki, R., S. Matsubara, and H. Miyajima (2002) The crystal structure of rengeite, Sr<sub>4</sub>ZrTi<sub>4</sub>(Si<sub>2</sub>O<sub>7</sub>)<sub>2</sub>O<sub>8</sub>. *J. Mineral. and Petrol. Sci.*, 97, 7-12. (3) Mashima, H., J. Akai, Y. Nakamuta, and S. Matsubara (2008) Orthorhombic polymorph of rengeite from Ohmi region, central Japan. *Amer. Mineral.*, 93, 1153-1157.