**Shigaite** $NaMn_6^{2+}Al_3(SO_4)_2(OH)_{18}\cdot 12H_2O$



**Crystal Data:** Hexagonal. *Point Group:* $\overline{3}$. Hexagonal tabular crystals, to 2 cm, may be in groups; as thin films and fracture coatings. *Twinning:* On {0001}.

**Physical Properties:** *Cleavage:* On {0001}, perfect. *Tenacity:* Moderately flexible. Hardness = ∼2 D(meas.) = 2.32 D(calc.) = 2.35

**Optical Properties:** Semitransparent. *Color:* Pale yellow, bright yellow, golden yellow, burnt orange; brownish yellow if included, brown to black if altered. *Streak:* Very pale yellow to white. *Luster:* Vitreous to dull.
*Optical Class:* Uniaxial (–). *Pleochroism:* Distinct; $O$ = yellow; $E$ = very pale yellow. *Absorption:* $O > E$. $\omega = 1.546$ $\epsilon$ = n.d.

**Cell Data:** *Space Group:* $R\overline{3}$. $a = 9.51$–$9.52$ $c = 32.83$–$33.074$ Z = 3

**X-ray Powder Pattern:** Ioi mine, Japan.
10.89 (100), 5.47 (90), 2.457 (90), 3.664 (80), 2.198 (60), 1.944 (60), 4.36 (40)

**Chemistry:**

| | (1) | (2) | (3) |
|---|---|---|---|
| $SO_3$ | 13.6 | 12.75 | 13.95 |
| $Al_2O_3$ | 15.3 | 11.8 | 13.32 |
| $Fe_2O_3$ | 0.9 | 2.6 | |
| MnO | 41.7 | 42.1 | 37.08 |
| MgO | | 0.25 | |
| $Na_2O$ | n.d. | n.d. | 2.70 |
| $H_2O$ | 28.0 | [30.5] | 32.95 |
| Total | 99.5 | [100.0] | 100.00 |

(1) Ioi mine,Japan; by electron microprobe, total Fe as $Fe_2O_3$, total Mn as MnO, $H_2O$ by TGA-EGA. (2) Iron Monarch quarry, Australia; by electron microprobe, average of two analyses, total Fe as $Fe_2O_3$, total Mn as MnO, $H_2O$ by difference. (3) $NaMn_6Al_3(SO_4)_2(OH)_{18}\cdot 12H_2O$.

**Occurrence:** A rare secondary mineral in metamorphosed manganese ore deposits.

**Association:** Rhodochrosite, sonolite, manganosite, pyrochroite, jacobsite, hausmannite, galaxite (Ioi mine, Japan); rhodochrosite, leucophoenicite, gageite, caryopilite (Wessels mine, South Africa); arsenoclasite, gatehouseite, hematite, hausmannite, manganoan ferroan calcite, barite, gypsum (Iron Monarch quarry, Australia).

**Distribution:** From the Ioi mine, about 25 km east of Kyoto, Shiga Prefecture, Japan. In South Africa, at the N'Chwaning mine, and large crystals from the Wessels mine, near Kuruman, Cape Province. In the Iron Monarch quarry, Iron Knob, South Australia. Large crystals from the Bengal Cannon mine, Iron Co., Michigan, USA.

**Name:** For Shiga Prefecture, Japan, within which the original locality, the Ioi mine, is located.

**Type Material:** National Museum of Natural History, Washington, D.C., USA, 122089.

**References:** (1) Peacor, D.R., P.J. Dunn, A. Kato, and F.J. Wicks (1985) Shigaite, a new manganese aluminum sulfate mineral from the Ioi mine, Shiga, Japan. Neues Jahrb. Mineral., Monatsh., 453–457. (2) (1986) Amer. Mineral., 71, 1546 (abs. ref. 1). (3) Pring, A., P.G. Slade, and W.D. Birch (1992) Shigaite from Iron Monarch, South Australia. Mineral. Mag., 56, 417–419. (4) Cooper, M.A. and F.C. Hawthorne (1996) The crystal structure of shigaite, $[AlMn_2^{2+}(OH)_6]_3(SO_4)_2Na(H_2O)_6H_2O_6$, a hydrotalcite-group mineral. Can. Mineral., 34, 91–97.