Minamiite $(Na, Ca, K)Al_3(SO_4)_2(OH)_6$

Crystal Data: Hexagonal. *Point Group:* $\overline{3}\ 2/m$. Flat hexagonal plates, to 0.2 mm.

Physical Properties: Hardness = [3.5–4] (by analogy to the alunite group).
D(meas.) = n.d. D(calc.) = 2.81

Optical Properties: Semitransparent. *Color:* White.
Optical Class: Uniaxial. ω = n.d. ϵ = n.d.

Cell Data: *Space Group:* $R\overline{3}m$. $a = 6.981(2)$ $c = 33.490(14)$ Z = 6

X-ray Powder Pattern: Okumanza, Japan.
2.964 (100), 4.906 (80), 2.792 (80), 2.225 (65), 5.591 (60), 1.8968 (45), 1.8607 (40)

Chemistry:

	(1)
SO_3	38.09
Al_2O_3	37.74
CaO	1.94
Na_2O	3.37
K_2O	2.17
H_2O^+	12.22
rem.	4.28
Total	99.81

(1) Okumanza, Japan; remnant, all considered due to impurities, consists of P_2O_5 0.18%, V_2O_3 0.02%, SiO_2 3.58%, Fe_2O_3 0.03%, TiO_2 0.45%, H_2O^- 0.02%; corresponds then to $(Na_{0.46}Ca_{0.29}K_{0.19})_{\Sigma=0.94}Al_{3.11}(SO_4)_2(OH)_{5.70}$.

Mineral Group: Alunite group.

Occurrence: In a hydrothermally altered labradorite andesite (Okumanza, Japan); deposited from fumarolic gasses (Mt. Rainier, Washington, USA); in volcanic-hosted argillic alteration (Barton Peninsula, Antarctica).

Association: Alunite, natroalunite, huangite, quartz (Okumanza, Japan); natroalunite, woodhouseite (Mt. Rainier, Washington, USA); pyrophyllite, pyrite, sulfur, zunyite, rutile, chalcedonic silica (Barton Peninsula, Antarctica).

Distribution: From Okumanza, near the Kusatsu-Shirane volcano, Gumma Prefecture, Japan. On Mt. Rainier, Pierce Co., Washington, USA. In the Quechisla district, Bolivia. From the El Indio mine, El Indio-Tambo district, east of La Serena, Coquimbo, Chile. In the Fancel-Laƀuşna caldera, Gurghui Mountains, Romania. On Barton Peninsula, King George Island, Antarctica.

Name: In honor of Dr. A.E. Minami (1899–1977), who studied the hot springs around the Kusatsu-Shirane volcano, Japan.

Type Material: National Science Museum, Tokyo, Japan.

References: (1) Ossaka, J., J.-I. Hirabayashi, K. Okada, and R. Kobayashi (1982) Crystal structure of minamiite, a new mineral of the alunite group. Amer. Mineral., 67, 114–119. (2) Ossaka, J., N. Otsuka, J.-I. Hirabayashi, K. Okada, and H. Soga (1987) Synthesis of minamiite, $Ca_{0.5}Al_3(SO_4)_2(OH)_6$. Neues Jahrb. Mineral., Monatsh., 49–63. (3) Li, G., D.R. Peacor, E.J. Essene, D.R. Brosnahan, and R.E. Beane (1992) Walthierite, $Ba_{0.5}\square_{0.5}Al_3(SO_4)_2(OH)_6$, and huangite, $Ca_{0.5}\square_{0.5}Al_3(SO_4)_2(OH)_6$, two new minerals of the alunite group from the Coquimbo region, Chile. Amer. Mineral., 77, 1275–1284 [IMA definition of minamiite].