Hielscherite $Ca_3Si(OH)_6(SO_4)(SO_3)•11H_2O$

Crystal Data: Hexagonal. *Point Group*: 6. Prismatic crystals to 1.5 mm, display {100} and {001}, in radiating groups. As acicular crystals to 0.2 mm, in nearly parallel or sheaf-like clusters, also as open chaotic aggregates to 4 mm, that resemble matted wool. In cauliflower-like clusters, to 1 cm [xenoliths in volcanic glass].

Physical Properties: *Cleavage*: Distinct on {100}. *Fracture*: Uneven or stepped.
Tenacity: Brittle. *Hardness* = 2-2.5 D(meas.) = 1.82(3) D(calc.) = 1.86
Slowly dissolves in HCl with very weak effervescence.

Optical Properties: Transparent. *Color*: Colorless; snow-white aggregates. *Streak*: White.
Luster: Vitreous; silky aggregates.
Optical Class: Uniaxial (–). ω = 1.494(2) ε = 1.476(2)

Cell Data: *Space Group*: $P6_3$. a = 11.1178(2) c = 10.5381(2) Z = 2

X-ray Powder Pattern: Graulay quarry, Rhineland-Palatinate, Germany.
9.62 (100), 3.823 (64), 5.551 (50), 2.742 (38), 4.616 (37), 2.528 (37), 2.180 (35)

Chemistry:

	(1)	(2)
CaO	27.15	26.93
Al_2O_3	2.33	
SiO_2	7.04	9.62
SO_3	[12.91]	12.82
SO_2	[6.40]	10.25
CO_2	2.71	
N_2O_5	0.42	
H_2O	39.22	40.38
Total	98.18	100.00
SO_3(meas.)	20.91	

(1) Graulay quarry, Rhineland-Palatinate, Germany; average of 8 electron microprobe analyses, complex anions confirmed by IR spectroscopy, SO_2 and SO_3 recalculated from SO_3(meas.) based on structural analysis, H_2O, CO_2, and N_2O_5 by gas chromatography and CHN analysis; corresponding to $Ca_3(Si_{0.73}Al_{0.28})_{\Sigma=1.01}(OH)_{5.71}(SO_4)_{1.00}(SO_3)_{0.62}(CO_3)_{0.38}(NO_3)_{0.05}•10.63H_2O$.
(2) $Ca_3Si(OH)_6(SO_4)(SO_3)•11H_2O$.

Polymorphism & Series: Forms a series with thaumasite.

Occurrence: In miarolitic cavities in alkaline basalt or also in xenoliths in volcanic glass.

Association: Diopside, nepheline, fluorapatite, magnetite, phillipsite-K, chabazite-Ca, gypsum, gismondine.

Distribution: From Graulay quarry near Hillesheim, western Eifel Mountains, Rhineland-Palatinate, Germany.

Name: Honors German mineral collector Klaus Hielscher (b. 1957) from Steinbach, Hessen, a specialist in the mineralogy of the Zeilberg basalt quarry in Franconia, Bavaria, Germany.

Type Material: A.E. Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow, Russia (#4093/1).

References: (1) Pekov, I.V., N.V. Chukanov, S.N. Britvin, Y.K. Kabalov, J. Göttlicher, V.O. Yapaskurt, A.E. Zadov, S.V. Krivovichev, W. Schüller, and B. Ternes (2012) The sulfite anion in ettringite-group minerals: a new mineral species hielscherite, $Ca_3Si(OH)_6(SO_4)(SO_3)•11H_2O$, and the thaumasite-hielscherite solid-solution series. Mineral. Mag., 76(5), 1133-1152. (2) (2015) Amer. Mineral., 100, 1324-1325 (abs. ref. 1).