

$\text{KNa}_{22}[\text{CO}_3]_2[\text{SO}_4]_9\text{Cl}$	<i>hP</i> 154	(176) $P6_3/m - i^9h^4gf^2ecb$
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$\text{KNa}_{22}(\text{CO}_3)_2(\text{SO}_4)_9\text{Cl}$ [2], hanksite
 Structural features: Layers containing SO_4 tetrahedra and Cl atoms in the ratio 3:1 alternate with two layers containing SO_4 tetrahedra and CO_3 trigonal units (perpendicular to [001]) in the same ratio. See Fig. IV.85.

Araki T., Zoltai T. (1973) [1]
 $\text{C}_2\text{ClKNa}_{22}\text{O}_{42}\text{S}_9$
 $a = 1.0465$, $c = 2.1191$ nm, $c/a = 2.025$, $V = 2.0098$ nm³, $Z = 2$

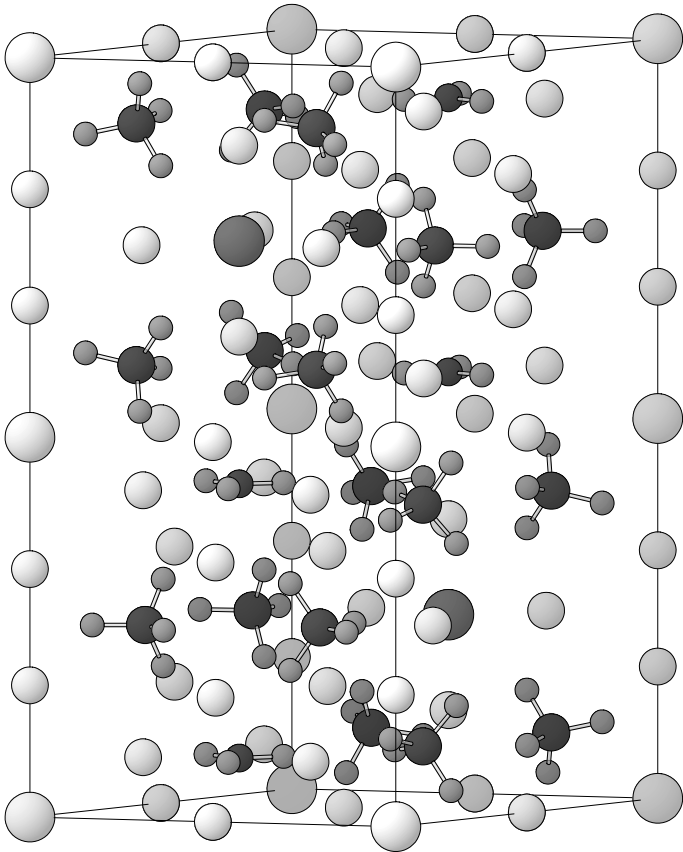


Fig. IV.85. **$\text{KNa}_{22}(\text{CO}_3)_2(\text{SO}_4)_9\text{Cl}$**

Arrangement of CO_3 triangles (C atoms small dark, O atoms small medium), SO_4 tetrahedra (S atoms medium size dark), K (large light), Na (medium size light) and Cl (large dark) atoms.

site	Wyck.	sym.	<i>x</i>	<i>y</i>	<i>z</i>	occ.	atomic environment
O1	12 <i>i</i>	1	0.04072	0.19609	0.10592		single atom S
O2	12 <i>i</i>	1	0.12418	0.44786	0.0803		single atom S
S3	12 <i>i</i>	1	0.17038	0.33869	0.0909		tetrahedron O ₄
O4	12 <i>i</i>	1	0.2428	0.32292	0.03427		single atom S
O5	12 <i>i</i>	1	0.27632	0.38977	0.14328		single atom S
Na6	12 <i>i</i>	1	0.36113	0.18237	0.07429		pentagonal bipyramid O ₆ C

O7	12i	1	0.43019	0.2322	0.19289	single atom S
Na8	12i	1	0.52262	0.05337	0.16098	tetrahedron O ₄
O9	12i	1	0.59651	0.19211	0.06988	single atom C
Na10	6h	m..	0.20006	0.34676	$\frac{1}{4}$	tetrahedron O ₄
O11	6h	m..	0.20129	0.10878	$\frac{1}{4}$	single atom S
S12	6h	m..	0.35679	0.14828	$\frac{1}{4}$	tetrahedron O ₄
O13	6h	m..	0.36881	0.01291	$\frac{1}{4}$	single atom S
Na14	6g	-1	$\frac{1}{2}$	0	0	octahedron O ₆
Na15	4f	3..	$\frac{1}{3}$	$\frac{2}{3}$	0.12429	7-vertex polyhedron O ₆ Cl
Cl16	4f	3..	$\frac{1}{3}$	$\frac{2}{3}$	0.56951	coplanar triangle O ₃
Na17	4e	3..	0	0	0.17348	octahedron O ₆
Cl18	2c	-6..	$\frac{1}{3}$	$\frac{2}{3}$	$\frac{1}{4}$	trigonal bipyramid Na ₅
K19	2b	-3..	0	0	0	icosahedron O ₁₂

Transformation from published data: origin shift 0 0 $\frac{1}{2}$

Experimental: single crystal, diffractometer, X-rays, R = 0.065

Remarks: Natural specimen from Searles Lake, California. The data from [2] are also reported in [3].

References: [1] Araki T., Zoltai T. (1973), Am. Mineral. 58, 799-801. [2] Kato K. (1972), Naturwissenschaften 59, 269. [3] Kato K., Saalfeld H. (1972), Acta Crystallogr. B 28, 3614-3617.