

47 Colemanite ($\text{Ca}_2\text{B}_6\text{O}_{11} \cdot 5\text{H}_2\text{O}$)

47A Pure compound

No. 47A-1 $\text{Ca}_2\text{B}_6\text{O}_{11} \cdot 5\text{H}_2\text{O}$, Colemanite

Another chemical formula $\text{CaB}_3\text{O}_4(\text{OH})_3 \cdot \text{H}_2\text{O}$ was proposed from the crystal-structure view point [58Chr]. Number of atoms in this formula is the same as in $(1/2)(\text{Ca}_2\text{B}_6\text{O}_{11} \cdot 5\text{H}_2\text{O})$ ($M = 411.09$)

1a	Ferroelectric activity in $\text{Ca}_2\text{B}_6\text{O}_{11} \cdot 5\text{H}_2\text{O}$ was discovered by Goldsmith in 1956.			56Gol
b	phase	II ^{a)}	I ^{b)}	^{a)} 56Gol
	state	F ^{a)}	P ^{b)}	^{b)} 58Hol
	crystal system	monoclinic ^{b)}	monoclinic ^{c)}	^{c)} 58Chr
	space group	$\text{P}2_1-\text{C}_2^2$ ^{b)}	$\text{P}2_1/\text{a}-\text{C}_{2\text{h}}^5$ ^{c)}	^{d)} 59Wie
	Θ [°C]	≈ -7 ^{d)}		
	$P_s \parallel [010]$.			
	$\rho = 2.42 \cdot 10^3 \text{ kg m}^{-3}$ at RT.			
	Transparent, colorless. Cleavage plane $\parallel (010)$.			
2a	Crystal growth: Small crystals are obtained by the dehydration of higher order hydrates of some calcium borates. Colemanite of high quality, however, has not yet been produced artificially. All data for the physical properties of colemanite described here are concerned with natural minerals.			60Wie
3a	Unit cell parameters: $a = 8.743(4) \text{ \AA}$, $b = 11.264(2) \text{ \AA}$, $c = 6.102(3) \text{ \AA}$, $\beta = 110^\circ 7(5)'$ at RT.			58Chr
b	$Z = 2$ in phases I ^{a)} and II ^{b)} [$Z = 4$ if the molecular unit is expressed as $\text{CaB}_3\text{O}_4(\text{OH})_3 \cdot \text{H}_2\text{O}$].			^{a)} 58Chr
	Crystal structure: Table 47A-1-001, Table 47A-1-002, Table 47A-1-003, Table 47A-1-004; Fig. 47A-1-001, Fig. 47A-1-002, Fig. 47A-1-003.			^{b)} 65Hai
5a	Dielectric constants: Fig. 47A-1-004, Fig. 47A-1-005, Fig. 47A-1-006, Fig. 47A-1-007.			
	$\Theta_p = -7^\circ \text{C}$, $C = 5 \cdot 10^2 \text{ K}$.			59Wie
b	$\xi = 7.6 \cdot 10^{13} \text{ V m}^5 \text{ C}^{-3}$, $\zeta = 9.2 \cdot 10^{17} \text{ V m}^9 \text{ C}^{-5}$.			59Wie
c	Spontaneous polarization: Fig. 47A-1-008.			
13a	NMR: Fig. 47A-1-009, Fig. 47A-1-010, Fig. 47A-1-011, Fig. 47A-1-012.			
15b	Switching current: Fig. 47A-1-013.			60Wie