

37 NaTh₂(PO₄)₃ family

37A Pure compounds

No. 37A-1 NaTh₂(PO₄)₃, Sodium dithorium trisphosphate

($M = 771.980$)

1a	Ferroelectricity in NaTh ₂ (PO ₄) ₃ was found at RT by Topic et al. in 1969.		69Top
b	phase	II	I
	state	F	
	crystal system	monoclinic	
	space group	Cc–C _s ⁴	
	Θ [K]	570	90Ste
	P_s : direction close to the a axis.		69Top
	$\rho = 5.41 \cdot 10^3 \text{ kg m}^{-3}$.		68Mat
2a	Crystal growth: B ₂ O ₃ flux method.		68Mat, 69Top, 74Kee
b	Crystal form: see		68Mat, 74Kee
3a	Unit cell parameters: $a = 17.37 \text{ \AA}$, $b = 6.81 \text{ \AA}$, $c = 8.13 \text{ \AA}$, $\beta = 101^\circ 03'$. Unit cell volume vs. ionic radius: Fig. 37A-1-001.		68Mat
b	A structural cavity formed by coordinated PO ₄ to Na site: see		74Kee
4	Thermal expansion coefficients in the range $-130^\circ\text{C} < T < 1050^\circ\text{C}$: $\alpha_{[100]} = 9.00(5) \cdot 10^{-6} \text{ K}^{-1}$, $\alpha_{[010]} = 4.0(4) \cdot 10^{-6} \text{ K}^{-1}$, $\alpha_{[001]} = 80(8) \cdot 10^{-6} \text{ K}^{-1}$.		72Top
5a	Dielectric constants: Fig. 37A-1-002, Fig. 37A-1-003.		
c	Remanent polarization: Fig. 37A-1-004. Coercive field: Fig. 37A-1-005.		
7a	Piezoelectric coefficient: $d \approx 3 \cdot 10^{-15} \text{ C N}^{-1}$ for elongation parallel to the spontaneous polarization, measured 21 days after poling.		69Top
9a	Refractive indices: $n_\alpha = 1.720(5)$, $n_\beta = 1.730(5)$, $n_\gamma = 1.745(5)$ for white light at 24°C .		74Kee
11	Electrical conductivity vs. temperature: Fig. 37A-1-006.		