

No. 33A-3 CsH₂PO₄, Cesium dihydrogen phosphate (CDP)*(M* = 229.89; [*D*: 231.90])1a Ferroelectricity of CsH₂PO₄ was first reported by Seidl in 1950. 50Sei

b phase	IV	III	II	I	
state	F	P			
crystal system	monoclinic ^{b)}	monoclinic ^{a)}			^{a)} 76Ues
space group	P2 ₁ –C ₂ ^{2b)}	P2 ₁ /m–C _{2h} ^{2a)}			^{b)} 80Iwa
Θ [°C]	–121.7 ^{a)} 149 ^{c)} 230 ^{c)} [<i>D</i> : –8.5 ^{d)}]				^{c)} 78Rap ^{d)} 78Ges

For phase I and phase II, see the phase diagram Fig. 33A-3-001, Fig. 33A-3-002.

Antiferroelectric phase (phase VII) was reported to exist under hydrostatic pressure;

Fig. 33A-3-003, Fig. 33A-3-004.

 Θ_f vs. deuteration rate: Fig. 33A-3-005. $P_s \parallel [010]$. $T_{\text{melt}} = 345$ °C. $\rho = 3.20 \cdot 10^3$ kg m^{–3}. $\rho_x = 3.28 \cdot 10^3$ kg m^{–3}.

76Ues

78Rap

78Nel

76Ues

2a Crystal growth: evaporation from aqueous solution. 77Ras

b Crystal form: Fig. 33A-3-006.

3a Unit cell parameters:

CsH₂PO₄, *T* = RT:

	<i>a</i> [Å]	<i>b</i> [Å]	<i>c</i> [Å]	β [°]	<i>Z</i>	
P2 ₁ /m cell	7.90065(8)	6.36890(9)	4.87254(12)	107.742(9)	2	76Ues
	7.912(2)	6.383(1)	4.880(1)	107.73(2)	2	80Mat
B2 ₁ /m cell	4.8725(1)	6.3689(1)	15.0499(8)	90.22(1)	4	78Nel

under hydrostatic pressure, $p = 3.6 \cdot 10^8$ Pa:

85Sch

<i>T</i> [K]	state	space group	<i>a</i> [Å]	<i>b</i> [Å]	<i>c</i> [Å]	β [°]	<i>Z</i>
130.0(5)	P	P2 ₁ /m	7.827(4)	6.268(1)	4.884(1)	108.16(3)	2
100.7(5)	(A)	P2 ₁	15.625(9)	6.254(2)	4.886(1)	108.08(3)	4
(phase VII)							

deuterated crystal, CsH_{2(1–x)}D_{2x}PO₄ (*x* = 0.97):

83Ito

<i>T</i> [K]	<i>a</i> [Å]	<i>b</i> [Å]	<i>c</i> [Å]	β [°]
283	7.906(1)	6.372(1)	4.883(1)	107.73(1)°
233	7.903(1)	6.347(1)	4.887(1)	107.96(1)°

Unit cell parameters vs. *T*: Table 33A-3-001;

see also Fig. 33A-3-015, Fig. 33A-3-016, Fig. 33A-3-017 in 4.

b *Z*: see 3a.

Crystal structure: Fig. 33A-3-007, Fig. 33A-3-008, Fig. 33A-3-009, Fig. 33A-3-010, Fig. 33A-3-011; see also

80Iwa

	Fractional coordinates and temperature parameters: Table 33A-3-002, Table 33A-3-003, Table 33A-3-004, Table 33A-3-005, Table 33A-3-006, Table 33A-3-007, Table 33A-3-008, Table 33A-3-009.	
	Temperature dependence of temperature parameters: see	83Ito
	Mean-square thermal amplitude: Table 33A-3-010; Fig. 33A-3-012.	
	Interatomic distances and angles: Table 33A-3-011, Table 33A-3-012; Fig. 33A-3-013; see also	76Ues
4	Thermal expansion: Fig. 33A-3-014, Fig. 33A-3-015, Fig. 33A-3-016, Fig. 33A-3-017, Fig. 33A-3-018.	
5a	Dielectric constant κ vs. T : Fig. 33A-3-019, Fig. 33A-3-020, Fig. 33A-3-021, Fig. 33A-3-022, Fig. 33A-3-023. Curie-Weiss constant: $C' = 4.3 \cdot 10^4$ K [D: $3.2 \cdot 10^4$ K]. Effect of hydrostatic pressure on κ : Fig. 33A-3-024, Fig. 33A-3-025. $d\epsilon/dE_{\text{bias}} = 5.8 \cdot 10^{-2}$ K kV ⁻¹ m. Dielectric dispersion: Fig. 33A-3-026, Fig. 33A-3-027, Fig. 33A-3-028, Fig. 33A-3-029, Fig. 33A-3-030, Fig. 33A-3-031, Fig. 33A-3-032, Fig. 33A-3-033, Fig. 33A-3-034, Fig. 33A-3-035; see also	75Lev 75Lev 84Koz, 85Gri
	Dielectric dispersion in the pressure-induced antiferroelectric phase VII: Fig. 33A-3-036, Fig. 33A-3-037, Fig. 33A-3-038. Activation energy of CsH _{2(1-x)} D _{2x} PO ₄ : see Phase diagram in regard to p : see Fig. 33A-3-001, Fig. 33A-3-002, Fig. 33A-3-003, Fig. 33A-3-004 in 1b and also Table 33A-1-030 in No. 33A-1. Dielectric constant in the ferroelectric phase: see Fig. 33A-1-073, Fig. 33A-1-074 in No. 33A-1. Effects of γ - and electron-irradiation on κ_c and $\tan\delta_c$: see	84Deg1 87Kam
b	Effect of E_{bias} on κ_b in phase VII: see Fig. 33A-3-036, Fig. 33A-3-037, Fig. 33A-3-038 in 5a. Shift of the temperature of κ_{max} on E_{bias} : Fig. 33A-3-039.	
c	P_s vs. T : Fig. 33A-3-040, Fig. 33A-3-041. Effect of deuteration on P_s vs. T : Fig. 33A-3-042. Effect of hydrostatic pressure on P_s and E_c : Fig. 33A-3-043, Fig. 33A-3-044. Sublattice polarization and critical field in the antiferroelectric phase VII: Fig. 33A-3-045, Fig. 33A-3-046.	
6a	Heat capacity: Fig. 33A-3-047, Fig. 33A-3-048, Fig. 33A-3-049; see also	78Met, 82Kan 85Ima
	Effect of γ -irradiation on C_p : see	
b	Thermal conductivity: Fig. 33A-3-050, Fig. 33A-3-051.	
7b	Electrostrictive constant: Fig. 33A-3-052.	
8a	Elastic compliance: Fig. 33A-3-053, Fig. 33A-3-054. Ultrasonic velocity and absorption coefficient: Table 33A-3-013; Fig. 33A-3-055, Fig. 33A-3-056, Fig. 33A-3-057, Fig. 33A-3-058, Fig. 33A-3-059, Fig. 33A-3-060, Fig. 33A-3-061, Fig. 33A-3-062; see also Mechanical Q -factor: Fig. 33A-3-063.	83Kan
9a	Refractive indices: Fig. 33A-3-064. Optical axial angle: Fig. 33A-3-065. Birefringence: Fig. 33A-3-066.	

33 KDP (KH₂PO₄) family

	Infrared transmission and reflection spectra: Fig. 33A-3-067, Fig. 33A-3-068, Fig. 33A-3-069, Fig. 33A-3-070; see also	82TiS
b	Electrooptic effect: Fig. 33A-3-071, Fig. 33A-3-072.	
10a	Raman scattering: Fig. 33A-3-073, Fig. 33A-3-074; see also Hyper-Raman scattering: Fig. 33A-3-075, Fig. 33A-3-076, Fig. 33A-3-077.	82Rum
b	Brillouin scattering: Fig. 33A-3-078.	
11	Electrical conductivity: Fig. 33A-3-079. Electrical conductivity from $T = RT$ to T_{melt} : see	89Bar
13a	NMR of deuteron: Table 33A-3-014; Fig. 33A-3-080, Fig. 33A-3-081. NQR of ¹⁷ O: Fig. 33A-3-082, Fig. 33A-3-083; see also Table 33A-1-058 in No. 33A-1. NMR of ³¹ P: Fig. 33A-3-084, Fig. 33A-3-085, Fig. 33A-3-086. NQR of ¹³³ Cs: Fig. 33A-3-087, Fig. 33A-3-088, Fig. 33A-3-089.	
b	ESR of Cu ²⁺ : Table 33A-3-015; see also ESR of Tl ²⁺ : Fig. 33A-3-090. ESR of Cr ³⁺ : Table 33A-3-016. ESR of CrO ₄ ³⁻ : Table 33A-3-017; Fig. 33A-3-091. ESR of AsO ₃ ²⁻ : Table 33A-3-018; Fig. 33A-3-092.	86Wap
14b	Inelastic neutron scattering: Fig. 33A-3-093, Fig. 33A-3-094, Fig. 33A-3-095, Fig. 33A-3-096, Fig. 33A-3-097, Fig. 33A-3-098, Fig. 33A-3-099, Fig. 33A-3-100, Fig. 33A-3-101, Fig. 33A-3-102.	
15a	Lamellar domain structure was observed by scanning electron microscope.	95Oza
b	Domain switching: Fig. 33A-3-103, Fig. 33A-3-104, Fig. 33A-3-105.	