No. 33A-11 $NH_4H_2AsO_4$, Ammonium dihydrogen arsenate (ADA)

(M = 158.97; [D: 165.01])

1a Anomalous dielectric behavior of $NH_4H_2AsO_4$ was first reported by Busch in 1937. 37Bus

b

phase	II	I
state	(A) *)	P
crystal system	orthorhombic	tetragonal
space group	$P2_12_12_1 - D_2^4$	$I\bar{4}2d - D_{2d}^{12}$
Θ [K]	216 [a]) [D: 304] [a])	

37Bus

[a]) 53Fra

Θ_{I-I} vs. x of $(NH_4H_2)_{1-x}(ND_4D_2)_xAsO_4$: Fig. 33A-11-001.
Θ_{I-I} of DADA with 98% deuteration is 302.3 K. 78Ber
$\rho = 2.307 \cdot 10^3$ kg m^{-3}, $\rho_X = 2.313 \cdot 10^3$ kg m^{-3}. 73Kha
*) Antiferroelectric model in phase II was proposed by Nagamiya. 52Nag

2a Crystal growth: evaporation or cooling from aqueous solution with addition of small amount of alkali (pH ≈ 5.5).
Table 33A-11-001.
Crystal growth of $(NH_4H_2)_{1-x}(ND_4D_2)_xAsO_4$: see 78Ber

3a Unit cell parameters: a = 7.6998(5) Å, c = 7.7158(12) Å at 22 °C; 73Kha
see also Table 33A-1-003, Table 33A-1-004 in No. 33A-1.
c/a vs. ionic radii: Fig. 33A-11-002.

b Z = 4. 73Kha
Crystal structure: Fig. 33A-11-003.
Positional and thermal parameters: Table 33A-11-002.
Fig. 33A-11-004.
Interatomic distances and bond angles: Table 33A-11-003, Table 33A-11-004;
see also Table 33A-5-003, Table 33A-5-009 in No. 33A-5.
Root mean square thermal displacement: see Table 33A-5-010 in No. 33A-5.
X-ray structure analysis at 34 K, 301 K, 260, 220 K in phase I and 212 K, 187 K, 157 K, 122 K in phase II. 90Fuk

4 Thermal expansion: Table 33A-1-029 in No. 33A-1.

5a Dielectric constants: Fig. 33A-11-005, Fig. 33A-11-006, Fig. 33A-11-007, Fig. 33A-11-008, Fig. 33A-11-009.
Curie-Weiss law: $\kappa_a = C/(T - \Theta_p)$ with C = 18300 K, Θ_p = 60 K. 92Lee
Effect of hydrostatic pressure on κ_a vs. T: Fig. 33A-11-010, Fig. 33A-11-011.
Phase diagram in regard to p: Fig. 33A-11-012.

6a Heat capacity: Fig. 33A-11-013.
Transition heat ΔQ_m and transition entropy ΔS_m: ΔQ_m = 990 J mol^{-1}, ΔS_m = 4.51 J K^{-1} mol^{-1}. 44Ste

7a Piezoelectricity: Fig. 33A-11-014; see also 66Bec

8a Elastic compliance and stiffness: Table 33A-11-005; Fig. 33A-11-015.
Isotope effect on sound velocity: see 86Ber

9a Refractive indices:

λ [nm]	486	589	656	1874Top
n_o	1.5859	1.5766	1.5721	
n_e	1.5296	1.5217	1.5186	

See also Table 33A-11-006, Table 33A-11-007.
Coefficients of Sellmeier equation: see Table 33A-1-040, Table 33A-1-041 in No. 33A-1.
$\partial n/\partial T$: see Table 33A-7-008 in No. 33A-7.
Transmission for λ = 300…2000 nm: Fig. 33A-11-016.
Mode frequencies determined from infrared reflectivity: see Table 33B-10-001 in No. 33B-10.

b Electrooptic constant: $r_{63}^{\mathbf{T}} = 9.2 \cdot 10^{-12}$ m V^{-1} at RT for λ = 550 nm; 69Adh
see also Fig. 33A-7-034 in No. 33A-7.

c Piezooptic constant: $\pi_{66}^{\boldsymbol{E}} = -8.3 \cdot 10^{-12}$ m^2 N^{-1}. 66Bec

d Verdet constant: see Fig. 33A-1-205, Fig. 33A-1-206 in No. 33A-1.

e Second harmonic generation of a dye-laser by ADA: see 77Fer

10a Raman scattering: Fig. 33A-11-017, Fig. 33A-11-018;
see Fig. 33A-1-214 in No. 33A-1 and also 88Hay

11 Electrical conductivity: Fig. 33A-11-019.

13a NMR of proton and deuteron: Table 33A-11-008; Fig. 33A-11-020;
see Fig. 33A-5-062 in No. 33A-5, and also 73Gro, 50New

NMR of ^{75}As: Table 33A-11-009; Fig. 33A-11-021, Fig. 33A-11-022;
see also Fig. 33A-7-051, Fig. 33A-7-052 in No. 33A-7, and 73Bli, 76Adr

b ESR of CrO_4^{3-} : $g_{\|} = 1.9561(5)$, $g_{\perp} = 1.9740(5)$, $A_{\|} = 27.5(5) \cdot 10^{-4}$ T, 88Dal
$A_{\perp} = 10(4) \cdot 10^{-4}$ T (||: c direction) at 300 K [D: $g_{\|} = 1.9563(5)$, $g_{\perp} = 1.9749(5)$, $A_{\|} = 28.2(5) \cdot 10^{-4}$ T, $A_{\perp} = 10(4) \cdot 10^{-4}$ T at 310 K].
Fig. 33A-11-023, Fig. 33A-11-024, Fig. 33A-11-025, Fig. 33A-11-026;
see also Fig. 33A-5-064 in No. 33A-5 and Table 33A-7-010 in No. 33A-7.
ESR and ENDOR of Cr^{5+}: see 78Sha, 78Gai

ESR of Tl^{2+}: see 84Ech
ESR of NH^{3+}: see 93Wap
ESR of $(AsO_4)^{4-}$ in γ-ray irradiated crystal, see 72Dal, 76Cev

Spin-lattice relaxation time: see Fig. 33B-10-44 in No. 33B-10.
ENDOR of irradiated crystals: see 74Gai1, 74Gai2