No. 44A-2 $NaNH_4SeO_4 \cdot 2H_2O$, Sodium ammonium selenate dihydrate

(M = 220.02; [D: 228.06])

1a Ferroelectric activity in $NaNH_4SeO_4 \cdot 2H_2O$ was discovered by Aleksandrov et al. in 1969. 69Ale

b phase	II	I	[a]) 69Ale
state	F [a])	P [a])	[b]) 71Ale
crystal system	monoclinic [c])	orthorhombic [b])	[c]) 76Kru
space group	$P2_1 - C_2^{2}$ [c])	$P2_12_12_1 - D_2^{4}$ [b])	
Θ [K]	180(1) [b])		

Transparent, colorless. 71Ale

2a Crystal growth: cooling or evaporation method from aqueous solution. 71Ale

3a Unit cell parameters:
a = 8.405 Å, b = 13.137 Å, c = 6.287 Å at RT. 73Kru
a = 8.401 Å, b = 13.091 Å, c = 6.205 Å, γ = 91° 04′ at 148 K. 76Kru

b Z = 4 in phases I and II. 73Kru
Crystal structure at RT: Table 44A-2-001, Table 44A-2-002, Table 44A-2-003; Fig. 44A-2-001, Fig. 44A-2-002.
Crystal structure at 148 K: Table 44A-2-004, Table 44A-2-005; Fig. 44A-2-003.
For atomic positions of hydrogen atoms, see also 78Noz

5a Dielectric constants: Fig. 44A-2-004, Fig. 44A-2-005, Fig. 44A-2-006.
Curie-Weiss constant C = 496 K. 71Zai
$d\Theta/dp = -4.1(2) \cdot 10^{-8}$ K Pa^{-1} ($p \le 4 \cdot 10^8$ Pa). 73Ges

c Spontaneous polarization and coercive field: Fig. 44A-2-007;
see also 71Ale

d Pyroelectric effect: see 75Zhe

6a Heat capacity: Fig. 44A-2-008.
Transition heat: ΔQ_m = 669(21) J mol^{-1}. 72Ale

7a Piezoelectricity: Fig. 44-2-009.
$d_{36} = 10 \cdot 10^{-12}$ C N^{-1}, $d_{25} = 0.9 \cdot 10^{-12}$ C N^{-1}, $d_{14} = 0.42 \cdot 10^{-12}$ C N^{-1} at RT. 71Zai

8a Sound velocity: Fig. 44A-2-010, Fig. 44A-2-011, Fig. 44A-2-012.
Elastic stiffness: Fig. 44A-2-013.
$s_{66} = 2.4 \cdot 10^{-12}$ m^2 N^{-1}, $s_{55} = 2.56 \cdot 10^{-12}$ m^2 N^{-1}, $s_{44} = 1.66 \cdot 10^{-12}$ m^2 N^{-1}at RT. 71Zai

b For nonlinear properties of the deuterated crystal, see 78San

9a Refractive indices: n_a = 1.4902, n_b = 1.4943, n_c = 1.474 for λ = 632.8 nm, T = 296 K. 75Ani
See also Fig. 44A-1-011 in No. 44A-1.
Birefringence: Fig. 44A-2-014.
Rotation angle of optical indicatrix: Fig. 44A-2-015.

b Electrooptic effect: Fig. 44A-2-016.
Electrooptic constants: $r_{41} = 0.33 \cdot 10^{-12}$ m V^{-1}, $r_{51} = 0.07 \cdot 10^{-12}$ m V^{-1}, 75Ani
$r_{63} = 2.0 \cdot 10^{-12}$ m V^{-1} for λ = 632.8 nm, T = 296 K.

e Nonlinear optical property: Fig. 44A-2-017.

10a Raman scattering: Fig. 44A-2-018.

13a	NMR and ENDOR: Table 44A-2-006, Table 44A-2-007, Table 44A-2-008; Fig. 44A-2-019, Fig. 44A-2-020; see also	71Yuz, 77Ale