

No. 42A-2 (NH₄)₃H(SeO₄)₂, Triammonium hydrogen diselenate
(*M* = 341.04; [*D*]: 354.12)]

1a Ferroelectricity in (NH ₄) ₃ H(SeO ₄) ₂ was discovered by Gesi in 1977.							77Ges1	
b	phase	VI	V	IV	III	II	I	
	state	F	F					a) 93Pie
	crystal system			monoclinic	triclinic	trigonal	trigonal	b) 92Pie c) 93Luk
	space group			C2/c–C _{2h} ^{6 a)}	P $\bar{1}$ –C _i ^{1 b)}	R $\bar{3}$ –C _{3i} ^{2 c)}	R $\bar{3}m$ –D _{3d} ^{5 c)}	d) 93Aug e) 77Ges2
	Θ [K]	101 ^{d)}	181 ^{e)}	275 ^{e)}	302 ^{f)}	328 ^{f)}		f) 79Osa
Different space groups were reported for phase III and phase II.							87Kam, 87Kis, 91Mer 79Osa	
Transition temperatures of ca. 80% deuterated crystal: Θ _{V–IV} = 215 K, Θ _{IV–III} = 277 K, Θ _{III–II} = 295 K, Θ _{II–I} = 327 K.								
Transparent, colorless.								
2a Crystal growth: evaporation of aqueous solution.							77Ges2	
3a Unit cell parameters:								
Phase I: <i>a</i> = 6.090(1) Å, <i>c</i> = 22.759(5) Å in hexagonal unit cell. <i>T</i> = 355 K.							93Luk	
Phase II: <i>a</i> = 6.064(1) Å, <i>c</i> = 22.904(5) Å in hexagonal unit cell. <i>T</i> = 310 K.							93Luk	
Phase III: <i>a</i> = 8.421(2) Å, <i>b</i> = 6.052(1) Å, <i>c</i> = 22.970(5) Å, α = 90.79(3)°, β = 101.25(3)°, γ = 110.19(3)°. <i>T</i> = 296 K.							92Pie	
Phase IV: <i>a</i> = 10.440(2) Å, <i>b</i> = 6.011(1) Å, <i>c</i> = 15.825(3) Å, β = 103.99(3)°. <i>T</i> = 200 K.							93Pie	
b	phase	IV	III	II	I			a) 93Pie
	<i>Z</i>	4 ^{a)}	2 ^{b)}	3 ^{c)}	3 ^{c)}			b) 92Pie c) 93Luk
Crystal structure:								
Phases I and II: Table 42A-2-001, Table 42A-2-002; Fig. 42A-2-001; see also							91Mer	
Phase III: Table 42A-2-003, Table 42A-2-004, Table 42A-2-005; Fig. 42A-2-002.								
Phase IV: Table 42A-2-006, Table 42A-2-007, Table 42A-2-008; Fig. 42A-2-003.								
4 Thermal expansion: Fig. 42A-2-004.								
5a Dielectric constant: Fig. 42A-2-005, Fig. 42A-2-006.								
Curie constant of [(NH ₄) ₃ H] _{1–x} [(ND ₄) ₃ D] _x (SeO ₄) ₂ system: Fig. 42A-2-007.								
Phase diagram with regard to <i>p</i> : Fig. 42A-2-008.								
c Spontaneous polarization: Fig. 42A-2-009, Fig. 42A-2-010.								
6a Heat capacity: Fig. 42A-2-011.								
Transition heats and transition entropies: Table 42A-2-009.								
8a Velocity and attenuation of elastic waves: Fig. 42A-2-012, Fig. 42A-2-013.								
9a Birefringence: see Fig. 42A-1-024 in No. 42A-1.								
10a Raman scattering: Fig. 42A-2-014.								

42 $(\text{NH}_4)_3\text{H}(\text{SO}_4)_2$ family

11	Electrical conductivity: Table 42A-2-010; Fig. 42A-2-015.	
13a	NMR: Fig. 42A-2-016.	
b	ESR: Table 42A-2-011; Fig. 42A-2-017, Fig. 42A-2-018; see also	86Woj
16	Twin structures: see	87Kis
	Effect of non-stoichiometric growth: see	92Aug, 95Fuk