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Ferroelectrics and related substances

Subvolume B2: Inorganic substances other than oxides

(NH₄)₂SO₄ family ... K₃BiCl₆ · 2KCl · KH₃F₄

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IF Survey of contained data

Each chapter of this volume corresponds to one family consisting of similar substances. This Sub-volume B contains 30 families of inorganic substances other than oxides and thus 30 chapters, as listed in Table IG-1. Each section in a chapter is devoted to describing properties of one substance (pure compound or solid solution). Table IF-1 shows how the data are presented in each section: A section is divided into 16 subsections and each subsection gives the data on special properties (e.g., dielectric properties). The information given in each section is surveyed by a table at the beginning of the section according to the order of subsections 1...16 of Table IF-1.

A detailed two-dimensional survey of contained data is made in Table IF-2 which gives all the substances appearing in the subvolumes B along the ordinate and properties along the abscissa.

Table IF-1. Arrangement of data for each substance

Subsection	Information
1	History and fundamental quantities.
a	History (discoverer, year of discovery).
b	Fundamental quantities (phases, state (F, A, P), crystal system, space group of each phase, transition temperatures, direction of spontaneous polarization, melting point, density, transparency and color, cleavage plane, deliquescence and efflorescence, phase diagram for solid solution).
2	Material preparation and crystal growth.
a	Method, solubility in fluxes or solvents.
b	Crystal forms, a , b , c axes, X , Y , Z axes.
3	Crystal structure.
a	Unit cell parameters.
b	Crystal structure (Z , table of positional and temperature parameters, interatomic distances and bond angles, figure of crystal structures, structural change associated with phase transitions).
4	Lattice distortions (thermal expansion, lattice deformation associated with spontaneous polarization).
5	Dielectric properties.
a	Dielectric constants (κ vs. T , Curie-Weiss law constants, κ vs. p , κ vs. two- or one-dimensional pressure, κ vs. frequency, phase diagram in regard to p and E_{bias}).
b	Nonlinear dielectric properties (effect of E_{bias} on κ ; values of ξ and ζ).
c	Spontaneous polarization and coercive field (or critical field for antiferroelectrics).
d	Pyroelectric and electrocaloric effect.
6	Thermal properties.
a	Heat capacity, transition heat, transition entropy.
b	Thermal conductivity.
7	Electromechanical properties.
a	Piezoelectricity.
b	Electrostriction.
c	Nonlinear electromechanical properties.

(continued)

I Introduction

Table IF-1 (continued)

Subsection	Information
8	Elastic properties.
a	Elastic compliances and stiffnesses (including data on acoustic surface wave).
b	Nonlinear elastic properties.
9	Optical properties.
a	Refractive indices, birefringence, reflection, absorption (infrared region, visible region, ultraviolet region).
b	Electrooptic effect.
c	Piezooptic effect (photoelastic effect).
d	Optical activity (rotatory power), Faraday effect.
e	Nonlinear optical properties.
10	Properties studied by light scattering.
a	Raman scattering.
b	Brillouin scattering and Rayleigh scattering. (Elastic constants are given in 8a.)
11	Electrical conduction (conductivity, breakdown strength, thermoelectric effect, photoconductivity and photoemission, superconductivity, band structure).
12	Magnetic properties (magnetic susceptibility, spontaneous magnetization, magnetic structure, magnetoelectric effect).
13	Properties studied by magnetic resonance and Mössbauer effect.
a	NMR.
b	ESR and ENDOR.
c	Mössbauer effect.
14	Diffraction phenomena related with secondary structures and local structures.
a	Bragg reflections due to structural modulations.
b	Diffuse or inelastic scattering.
c	EXAFS.
15	Domains.
a	Domain structure.
b	Effects of electric field and mechanical stress.
16	Miscellanea (thin layer, surface layer, radiation damage, plasticity, dislocation, etchant, point defects, twin structure, stripe pattern, paraelectric resonance).

Table IF-2. Two-dimensional survey of contained data

This table indicates the pages where the required data for special properties and individual substances can be found. All the substances appearing in the subvolumes III/36B are given along the ordinate and properties along the abscissa. More detailed information on the properties can be found in Table IF-1. Abbreviations in this table: [F]: ferroelectric. [(F)]: possibility of ferroelectricity. [A]: antiferroelectric. [(A)]: possibility of antiferroelectricity.

Subvolume III/36B2		No.	Fundamentals	Material preparation	Crystal structure	Lattice distortion	Dielectric properties	Thermal properties	Electromechanical	Elastic properties	Optical properties	Light scattering	Conduction	Magnetism	NMR, ESR	Local structures	Domains	Miscellanea
No.	Substance																	
39 (NH4)2SO4 family																		
39A Pure compounds																		
1	(NH4)2SO4 [F]	39A-01	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•
2	K2SeO4 [F]	39A-02	•	•	•	•	•	•		•	•	•			•	•		
3	(NH4)2BeF4 [F]	39A-03	•	•	•	•	•	•	•	•	•	•			•	•	•	•
4	[N(CH3)4]2MnCl4	39A-04	•	•	•	•	•	•		•	•					•		
5	[N(CH3)4]2FeCl4 [F]	39A-05	•	•	•	•	•	•		•						•		•
6	K2CoCl4 [F]	39A-06	•	•	•	•	•	•								•		
7	Rb2CoCl4 [F]	39A-07	•	•	•		•	•		•		•				•		
8	[N(CH3)4]2CoCl4 [F]	39A-08	•	•	•	•	•	•		•	•	•			•	•		
9	K2ZnCl4 [F]	39A-09	•	•	•	•	•	•	•	•	•	•	•		•	•	•	
10	Rb2ZnCl4 [F]	39A-10	•	•	•	•	•	•		•	•	•	•		•	•	•	•
11	(NH4)2ZnCl4 [F]	39A-11	•	•	•	•	•			•	•	•			•	•		•
12	[N(CH3)4]2ZnCl4 [F]	39A-12	•	•	•	•	•	•		•	•	•			•	•	•	•
13	K2CoBr4 [F]	39A-13	•	•	•		•									•		
14	Rb2CoBr4 [F, (A)]	39A-14	•	•	•		•									•		
15	[N(CH3)4]2CuBr4 [F]	39A-15	•	•	•	•	•	•			•					•		
16	K2ZnBr4 [F]	39A-16	•	•	•		•	•								•		
17	Rb2ZnBr4 [F, (A)]	39A-17	•	•	•	•	•	•		•	•	•	•		•	•		•
18	(NH4)2ZnBr4 [F]	39A-18	•	•	•		•				•	•			•	•		
19	K2CoI4 [F]	39A-19	•	•	•		•											
20	K2ZnI4 [F]	39A-20	•	•	•		•											
21	Tl2ZnI4 [F]	39A-21	•	•	•		•					•	•					
22	[N(CH3)4]2ZnI4 [F]	39A-22	•	•	•		•	•			•	•			•			
39B Solid solutions																		
1	(NH4)2SO4–K2SO4	39B-01	•	•	•		•				•				•			
2	(NH4)2SO4–Rb2SO4	39B-02	•	•	•		•				•	•			•			
3	(NH4)2SO4–Cs2SO4	39B-03	•	•	•		•								•			
4	(NH4)2SO4–(NH4)2BeF4	39B-04	•		•	•		•							•	•		
5	[N(CH3)4]2MnCl4–[N(CH3)4]2ZnCl4	39B-05	•															

Subvolume III/36B2		No.	Fundamentals	Material preparation	Crystal structure	Lattice distortion	Dielectric properties	Thermal properties	Electromechanical	Elastic properties	Optical properties	Light scattering	Conduction	Magnetism	NMR, ESR	Local structures	Domains	Miscellanea
No.	Substance																	
6	$[\text{N}(\text{CH}_3)_4]_2\text{CoCl}_4\text{--}[\text{N}(\text{CH}_3)_4]_2\text{ZnCl}_4$	39B-06	•															
7	$\text{K}_2\text{ZnCl}_4\text{--Rb}_2\text{ZnCl}_4$	39B-07	•				•									•	•	
8	$\text{Rb}_2\text{ZnCl}_4\text{--Cs}_2\text{ZnCl}_4$	39B-08					•											
9	$(\text{NH}_4)_2\text{ZnCl}_4\text{--}(\text{NH}_4)_2\text{ZnBr}_4$	39B-09	•	•												•		
10	$[\text{N}(\text{CH}_3)_4]_2\text{ZnCl}_4\text{--}[\text{N}(\text{CH}_3)_4]_2\text{ZnBr}_4$	39B-10	•		•		•					•				•		
11	$[\text{N}(\text{CH}_3)_4]_2\text{CuBr}_4\text{--}[\text{N}(\text{CH}_3)_4]_2\text{CuCl}_4$	39B-11	•				•									•		
40 NH_4HSO_4 family																		
40A Pure compounds																		
1	KHSO_4	40A-01													•			
2	$\text{RbHSO}_4 [\text{F}]$	40A-02	•	•	•		•	•		•	•	•			•		•	
3	CsHSO_4	40A-03	•	•	•					•					•			
4	TiHSO_4	40A-04													•			
5	$\text{NH}_4\text{HSO}_4 [\text{F}]$	40A-05	•	•	•		•	•			•	•	•		•	•	•	
6	$\text{N}(\text{CH}_3)_4\text{HSO}_4 [(\text{F})]$	40A-06	•	•	•		•	•			•					•		
7	$\text{RbHSeO}_4 [\text{F}]$	40A-07	•	•	•	•	•				•	•			•		•	
8	CsHSeO_4	40A-08	•	•	•										•			
9	$\text{NH}_4\text{HSeO}_4 [\text{F}]$	40A-09	•	•	•	•	•	•		•	•	•			•	•	•	•
40B Solid solutions																		
1	$\text{RbHSO}_4\text{--CsHSO}_4$	40B-01			•													
2	$\text{RbHSO}_4\text{--RbHSeO}_4$	40B-02	•				•											
3	$\text{CsHSO}_4\text{--NH}_4\text{HSO}_4$	40B-03	•		•													
4	$\text{NH}_4\text{HSO}_4\text{--NH}_4\text{HSeO}_4$	40B-04	•				•											
5	$\text{RbHSeO}_4\text{--NH}_4\text{HSeO}_4$	40B-05	•				•											
41 NH_4LiSO_4 family																		
41A Pure compounds																		
1	NaLiSO_4	41A-01			•										•			
2	KLiSO_4	41A-02	•	•	•	•	•	•	•	•	•	•			•	•	•	

Subvolume III/36B2			Fundamentals	Material preparation	Crystal structure	Lattice distortion	Dielectric properties	Thermal properties	Electromechanical	Elastic properties	Optical properties	Light scattering	Conduction	Magnetism	NMR, ESR	Local structures	Domains	Miscellanea
No.	Substance	No.																
3	RbLiSO ₄ [F]	41A-03	•	•	•		•	•			•	•	•			•		
4	CsLiSO ₄	41A-04	•	•	•					•	•	•			•	•		
5	NH ₄ LiSO ₄ [F]	41A-05	•	•	•	•	•	•		•	•	•			•	•	•	•
6	CsRbSeO ₄ [F]	41A-06	•		•		•	•										•
7	RbLiMoO ₄ [F]	41A-07	•		•													•
8	CsLiMoO ₄ [F]	41A-08	•	•	•		•			•	•				•			
9	CsLiWO ₄ [F]	41A-09	•		•		•	•			•							
41B Solid solutions																		
1	RbLiSO ₄ –CsLiSO ₄	41B-01	•													•		
2	RbLiSO ₄ –NH ₄ LiSO ₄	41B-02	•													•		
42 (NH₄)₃H(SO₄)₂ family																		
42A Pure compounds																		
1	(NH ₄) ₃ H(SO ₄) ₂ [F]	42A-01	•	•	•	•	•	•			•	•	•		•			
2	(NH ₄) ₃ H(SeO ₄) ₂ [F]	42A-02	•	•	•	•	•	•		•	•	•	•		•			•
43 Langbeinite (K₂Mg₂(SO₄)₃) family																		
43A Pure compounds																		
1	(NH ₄) ₂ Mg ₂ (SO ₄) ₃	43A-01	•		•	•	•	•							•			
2	K ₂ Mg ₂ (SO ₄) ₃	43A-02	•	•	•		•	•			•		•		•			
3	Rb ₂ Mg ₂ (SO ₄) ₃	43A-03			•		•								•			
4	K ₂ Ca ₂ (SO ₄) ₃	43A-04	•		•			•			•		•		•			
5	Rb ₂ Ca ₂ (SO ₄) ₃	43A-05	•		•		•								•			
6	(NH ₄) ₂ Ca ₂ (SO ₄) ₃	43A-06	•		•		•											
7	(NH ₄) ₂ Mn ₂ (SO ₄) ₃	43A-07	•	•	•						•				•			
8	K ₂ Mn ₂ (SO ₄) ₃	43A-08	•	•	•	•	•	•		•	•	•		•	•			
9	K ₂ Fe ₂ (SO ₄) ₃	43A-09	•		•		•								•			
10	K ₂ Co ₂ (SO ₄) ₃ [(F)]	43A-10	•	•	•		•	•			•	•		•				

Subvolume III/36B2		No.	Fundamentals	Material preparation	Crystal structure	Lattice distortion	Dielectric properties	Thermal properties	Electromechanical	Elastic properties	Optical properties	Light scattering	Conduction	Magnetism	NMR, ESR	Local structures	Domains	Miscellanea
No.	Substance																	
11	$\text{K}_2\text{Zn}_2(\text{SO}_4)_3$ [F]	43A-11	•	•	•		•			•					•		•	
12	$\text{K}_2\text{Cd}_2(\text{SO}_4)_3$	43A-12	•	•	•	•	•	•	•	•	•	•	•		•	•	•	
13	$(\text{NH}_4)_2\text{Cd}_2(\text{SO}_4)_3$ [F]	43A-13	•	•	•	•	•	•	•	•	•	•			•		•	
14	$\text{Rb}_2\text{Cd}_2(\text{SO}_4)_3$ [F]	43A-14	•	•	•	•	•	•		•	•	•			•		•	
15	$\text{Tl}_2\text{Cd}_2(\text{SO}_4)_3$ [F]	43A-15	•	•	•	•	•	•		•	•	•			•		•	
16	$\text{K}_2\text{Mn}_2(\text{BeF}_4)_3$	43A-16	•	•	•													
43B Solid solutions																		
1	$\text{Tl}_2\text{Cd}_2(\text{SO}_4)_3-(\text{NH}_4)_2\text{Cd}_2(\text{SO}_4)_3$	43B-01	•	•	•		•			•								
2	$(\text{NH}_4)_2\text{Mn}_2(\text{SO}_4)_3-(\text{NH}_4)_2\text{Cd}_2(\text{SO}_4)_3$	43B-02			•													
3	$\text{Tl}_2\text{Cd}_2(\text{SO}_4)_3-\text{K}_2\text{Cd}_2(\text{SO}_4)_3$	43B-03	•		•													
4	$(\text{NH}_4)_2\text{Mn}_2(\text{SO}_4)_3-\text{K}_2\text{Mn}_2(\text{SO}_4)_3$	43B-04		•	•			•										
5	$\text{K}_2\text{Mn}_2(\text{SO}_4)_3-\text{Tl}_2\text{Mn}_2(\text{SO}_4)_3$	43B-05	•	•	•			•										
6	$(\text{NH}_4)_2\text{Mn}_2(\text{SO}_4)_3-(\text{NH}_4)_2\text{Mn}_2(\text{SeO}_4)_3$	43B-06	•	•	•			•										
7	$\text{Tl}_2\text{Mn}_2(\text{SO}_4)_3-\text{Tl}_2\text{Mn}_2(\text{SeO}_4)_3$	43B-07	•	•														
8	$\text{K}_2\text{Mn}_2(\text{SO}_4)_3-\text{K}_2\text{Mn}_2(\text{SeO}_4)_3$	43B-08	•	•	•													
44 $\text{NaNH}_4\text{SO}_4 \cdot 2\text{H}_2\text{O}$ (lecontite) family																		
44A Pure compounds																		
1	$\text{NaNH}_4\text{SO}_4 \cdot 2\text{H}_2\text{O}$ [F]	44A-01	•	•	•	•	•	•			•	•			•		•	
2	$\text{NaNH}_4\text{SeO}_4 \cdot 2\text{H}_2\text{O}$ [F]	44A-02	•	•	•		•	•	•	•	•	•			•			
44B Solid solution																		
1	$\text{NaNH}_4\text{SO}_4 \cdot 2\text{H}_2\text{O}-\text{NaNH}_4\text{SeO}_4 \cdot 2\text{H}_2\text{O}$	44B-01	•				•											
45 Alum $(\text{NH}_4\text{Fe}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O})$ family																		
45A Pure compounds																		
1	$\text{NH}_4\text{Al}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ [F]	45A-01	•	•	•		•											
2	$\text{NH}_4\text{V}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ [F]	45A-02	•	•	•		•											
3	$\text{NH}_4\text{Cr}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ [F]	45A-03	•	•	•		•											

Subvolume III/36B2		No.	Fundamentals	Material preparation	Crystal structure	Lattice distortion	Dielectric properties	Thermal properties	Electromechanical	Elastic properties	Optical properties	Light scattering	Conduction	Magnetism	NMR, ESR	Local structures	Domains	Miscellanea
No.	Substance																	
4	$\text{NH}_4\text{Fe}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ [F]	45A-04	•	•	•		•				•				•			
5	$\text{NH}_4\text{In}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ [F]	45A-05	•	•	•		•											
6	$\text{CH}_3\text{NH}_3\text{Al}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ [F]	45A-06	•	•	•	•	•	•		•	•				•			
7	$\text{CH}_3\text{NH}_3\text{V}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ [F]	45A-07	•	•	•		•											
8	$\text{CH}_3\text{NH}_3\text{Cr}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ [F]	45A-08	•	•	•		•	•							•			
9	$\text{CH}_3\text{NH}_3\text{Fe}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ [F]	45A-09	•	•	•		•				•							
10	$\text{CH}_3\text{NH}_3\text{Ga}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ [F]	45A-10	•	•			•				•				•			
11	$\text{CH}_3\text{NH}_3\text{In}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ [F]	45A-11	•	•	•		•											
12	$\text{CH}_3\text{NH}_3\text{Al}(\text{SeO}_4)_2 \cdot 12\text{H}_2\text{O}$ [F]	45A-12	•	•	•		•				•				•			
13	$\text{CH}_3\text{NH}_3\text{Cr}(\text{SeO}_4)_2 \cdot 12\text{H}_2\text{O}$ [F]	45A-13	•		•		•											
14	$\text{CH}_3\text{NH}_3\text{Ga}(\text{SeO}_4)_2 \cdot 12\text{H}_2\text{O}$ [F]	45A-14	•		•		•											
15	$\text{N}_2\text{H}_5\text{Al}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ [F]	45A-15	•	•	•		•											
16	$\text{CO}(\text{NH}_2)_2\text{HCr}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$	45A-16	•															
45B Solid solutions																		
1	$\text{CH}_3\text{NH}_3\text{Al}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O} - \text{NH}_2\text{NH}_3\text{Al}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$	45B-01	•				•											
2	$\text{CH}_3\text{NH}_3\text{Al}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O} - \text{CH}_3\text{NH}_3\text{Al}(\text{SeO}_4)_2 \cdot 12\text{H}_2\text{O}$	45B-02	•				•											
46 GASH ($\text{C}(\text{NH}_2)_3\text{Al}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$) family																		
46A Pure compounds																		
1	$\text{C}(\text{NH}_2)_3\text{Al}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ [F]	46A-01	•	•	•	•	•		•	•	•	•	•		•		•	•
2	$\text{C}(\text{NH}_2)_3\text{V}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ [F]	46A-02	•		•		•							•	•			
3	$\text{C}(\text{NH}_2)_3\text{Cr}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ [F]	46A-03	•		•		•								•			
4	$\text{C}(\text{NH}_2)_3\text{Ga}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ [F]	46A-04	•	•	•	•	•			•	•				•			
5	$\text{C}(\text{NH}_2)_3\text{Al}(\text{SeO}_4)_2 \cdot 6\text{H}_2\text{O}$ [F]	46A-05	•	•	•	•	•			•	•				•			
6	$\text{C}(\text{NH}_2)_3\text{Cr}(\text{SeO}_4)_2 \cdot 6\text{H}_2\text{O}$ [F]	46A-06	•		•		•											
7	$\text{C}(\text{NH}_2)_3\text{Ga}(\text{SeO}_4)_2 \cdot 6\text{H}_2\text{O}$ [F]	46A-07	•	•	•	•	•			•	•				•		•	
8	$(\text{CH}_3)_2\text{NH}_2\text{Al}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ [F]	46A-08	•	•	•		•				•	•						•
9	$(\text{CH}_3)_2\text{NH}_2\text{Ga}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ [F]	46A-09	•	•	•	•	•											

Subvolume III/36B2		No.	Fundamentals	Material preparation	Crystal structure	Lattice distortion	Dielectric properties	Thermal properties	Electromechanical	Elastic properties	Optical properties	Light scattering	Conduction	Magnetism	NMR, ESR	Local structures	Domains	Miscellanea
No.	Substance																	
46B Solid solution																		
1	(CH ₃) ₂ NH ₂ Al(SO ₄) ₂ ·6H ₂ O– (CH ₃) ₂ NH ₂ Al(SeO ₄) ₂ ·6H ₂ O	46B-01	•		•													
47 Colemanite (Ca ₂ B ₆ O ₁₁ ·5H ₂ O)																		
47A Pure compound																		
1	Ca ₂ B ₆ O ₁₁ ·5H ₂ O [F]	47A-01	•	•	•		•								•	•		
48 K ₄ Fe(CN) ₆ ·3H ₂ O family																		
48A Pure compounds																		
1	K ₄ Mn(CN) ₆ ·3H ₂ O [F]	48A-01	•				•											
2	K ₄ Fe(CN) ₆ ·3H ₂ O [F]	48A-02	•	•	•		•	•		•	•	•	•		•	•	•	
3	K ₄ Ru(CN) ₆ ·3H ₂ O [F]	48A-03	•		•		•				•				•			
4	K ₄ Os(CN) ₆ ·3H ₂ O [F]	48A-04	•		•		•											
48B Solid solutions																		
1	K ₄ Fe(CN) ₆ ·3H ₂ O–Rb ₄ Fe(CN) ₆ ·3H ₂ O	48B-01	•				•											
2	K ₄ Fe(CN) ₆ ·3H ₂ O–Tl ₄ Fe(CN) ₆ ·3H ₂ O	48B-02	•				•											
3	K ₄ Fe(CN) ₆ ·3H ₂ O– (NH ₄) ₄ Fe(CN) ₆ ·3H ₂ O	48B-03	•				•											
49 K ₃ BiCl ₆ ·2KCl·KH ₃ F ₄																		
49A Pure compound																		
1	K ₃ BiCl ₆ ·2KCl·KH ₃ F ₄ [F]	49A-01	•		•		•			•								

Subvolume III/36B2		No.	Fundamentals	Material preparation	Crystal structure	Lattice distortion	Dielectric properties	Thermal properties	Electromechanical	Elastic properties	Optical properties	Light scattering	Conduction	Magnetism	NMR, ESR	Local structures	Domains	Miscellanea
No.	Substance																	
M Miscellaneous crystals																		
M15 SnTe group																		
M15-i	GeTe [(F)]	M15-i	•	•	•	•	•	•			•	•	•		•		•	
M15-ii	SnTe [(F)]	M15-ii	•	•	•	•	•	•		•	•	•	•		•	•		
M15-iii	Ge _{1-x} Sn _x Te	M15-iii	•	•	•	•		•		•					•			
M15-iv	Pb _{1-x} Ge _x Te	M15-iv	•		•	•	•	•		•	•	•	•			•		
M15-v	Pb _{1-x} Sn _x Te	M15-v	•				•			•	•		•		•			
M15-vi	Cd _{1-x} Zn _x Te	M15-vi	•	•	•		•	•			•	•	•			•		
M16	PbN ₆	M16	•	•		•	•		•								•	•
M17	Sb ₂ S ₃ [F]	M17	•	•	•		•			•	•		•		•	•	•	
M18	Sb ₅ O ₇ I [F]	M18	•	•	•	•	•			•	•	•						
M19	H ₂ O [(F)]	M19	•		•	•	•	•		•	•	•	•		•	•		
M20 KOH group																		
M20-i	NaOD [(A)]	M20-i	•		•	•	•	•			•	•			•	•		
M20-ii	KOH [(A)]	M20-ii	•		•	•	•	•							•			
M20-iii	RbOH [(F)]	M20-iii	•		•	•		•			•	•			•			
M20-iv	CsOH [(A)]	M20-iv	•		•	•	•	•			•	•			•			
M21	KSCN [(A)]	M21	•	•	•		•	•		•	•	•			•	•		•
M22	Na ₃ Sc ₂ (PO ₄) ₃ [(F)]	M22	•	•	•		•				•		•					•
M23	H ₂ (UO ₂) ₂ (AsO ₄) ₂ ·8H ₂ O [(A,F)]	M23	•		•		•								•		•	
M24 Li(N ₂ H ₅)SO ₄ group																		
M24-i	Li(N ₂ H ₅)SO ₄	M24-i	•	•	•	•	•	•			•	•	•		•	•		
M24-ii	Li(N ₂ H ₅)BeF ₄	M24-ii	•	•	•		•				•		•					
M25	N(CH ₃) ₄ HSO ₄ ·H ₂ O [(F)]	M25	•	•			•	•										
M26 Ag ₂ H ₃ IO ₆ group																		
M26-i	Ag ₂ H ₃ IO ₆ [(A)]	M26-i	•	•	•		•	•			•				•	•		
M26-ii	(NH ₄) ₂ H ₃ IO ₆ [(A)]	M26-ii	•	•	•		•	•			•	•			•			
M27 TiNbWO ₆ ·nH ₂ O group																		
M27-i	RbNbWO ₆ ·nH ₂ O [(F)]	M27-i	•	•	•		•				•		•				•	
M27-ii	TiNbWO ₆ ·nH ₂ O [(F)]	M27-ii	•	•	•		•				•		•				•	
M28	NH ₄ PF ₆ ·NH ₄ F [(A)]	M28	•		•		•								•			

(NH₄)₂SO₄ family ... K₃BiCl₆ · 2KCl · KH₃F₄
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