

**Volume 30**  
**High Frequency Properties of Dielectric Crystals**

**Subvolume A**  
**Piezooptic and Electrooptic Constants**

	Introductory material	
1 - 2	See Vol. 29A	
3 - 4	See Vol. 29B	
5	Piezooptic and electrooptic constants of crystals	1
5.1	Introduction (D.F. NELSON)	1
5.1.1	Definitions	1
5.1.2	List of symbols	1
5.1.3	Index ellipsoid	3
5.1.4	Linear perturbations of index ellipsoid	3
5.1.5	Rotooptic effect	4
5.1.6	Interchange symmetry	4
5.1.7	Matrix notation	5
5.1.8	Crystal symmetry	6
5.1.9	Constitutive relations	7
5.1.10	Piezooptic relations	8
5.1.11	Electrooptic relations	9
5.1.12	Refractive index change formulas	9
5.1.13	Piezooptic measurements	13
5.1.14	Electrooptic measurements	14
5.1.15	Relation to nonlinear susceptibilities	14
5.1.16	Quadratic electrooptic effect	15
5.1.17	Piezooptics of absorbing crystals	16
5.2	Piezooptic and elastooptic coefficients (K. VEDAM)	17
5.2.1	Comments on tabulated data	17
5.2.2	Piezooptic and elastooptic coefficients	19
5.2.2.1	Cubic system: Classes (-4)3m ( $T_d$ ), 432 (O), m3m ( $O_h$ )	19
5.2.2.2	Cubic system: Classes 23 (T), m3( $T_h$ )	50
5.2.2.3	Hexagonal system: Classes (-6)m2 ( $D_{3h}$ ), 6mm ( $C_{6v}$ ), 622 ( $D_6$ ), 6/mm ( $D_{6h}$ )	56
5.2.2.4	Hexagonal system: Classes 6 ( $C_6$ ), (-6) ( $C_{3h}$ ), 6/m ( $C_{6h}$ )	58
5.2.2.5	Trigonal system: Classes 3m ( $C_{3v}$ ), 32 ( $D_3$ ), (-3)m ( $D_{3d}$ )	59
5.2.2.6	Trigonal system: Classes 3( $C_3$ ), (-3)(S6)	63
5.2.2.7	Tetragonal system: Classes 4mm ( $C_{4v}$ ), (-4)2m ( $D_{2d}$ ), 422 ( $D_4$ ), 4/mmm ( $D_{4h}$ )	64
5.2.2.8	Tetragonal system: Classes 4 ( $C_4$ ), (-4) ( $S_4$ ), 4/m ( $C_{4h}$ )	69
5.2.2.9	Orthorhombic system: All classes, 222 ( $D_2$ ), mm2 ( $C_{2v}$ ), mmm ( $D_{2h}$ )	71
5.2.2.10	Monoclinic system: All classes, 2 ( $C_2$ ), m ( $C_s$ ), 2/m ( $C_{2h}$ )	82
5.2.2.11	Triclinic system: All classes, 1 ( $C_1$ ), and 1 ( $C_i$ )	85
5.2.3	Rotooptic coefficients $\sigma$	86
5.2.4	Figures	88

5.3	Electrooptic coefficients (W.R. COOK JR)	164
5.3.1	Special introduction	164
5.3.1.1	List of symbols	164
5.3.1.2	Comments on tabulated data	165
5.3.1.3	Electrogyration	168
5.3.2	Tables of linear electrooptic coefficients	170
5.3.2.1	Cubic, (-4)3m ( $T_d$ )	170
5.3.2.2	Cubic (isometric), 23( $T$ )	174
5.3.2.3	Hexagonal, 622 ( $D_6$ )	177
5.3.2.4	Hexagonal, (-6)m2 ( $D_{3h}$ )	177
5.3.2.5	Hexagonal, 6mm ( $C_{6v}$ )	178
5.3.2.6	Poled ceramics, $\infty m$ ( $C_{\infty v}$ )	179
5.3.2.7	Symmetry $\infty m$ ( $C_{\infty v}$ ), polymer sheet	181
5.3.2.8	Hexagonal, 6 ( $C_6$ )	182
5.3.2.9	Trigonal (rhombohedral), 32 ( $D_3$ )	183
5.3.2.10	Trigonal (rhombohedral), 3m ( $C_{3v}$ )	184
5.3.2.11	Trigonal (rhombohedral), 3 ( $C_3$ )	187
5.3.2.12	Tetragonal, 422 ( $D_4$ )	187
5.3.2.13	Tetragonal, (-4)2m ( $D_{2d}$ )	188
5.3.2.14	Tetragonal, 4mm ( $C_{4v}$ )	197
5.3.2.15	Tetragonal, (-4) ( $S_4$ )	201
5.3.2.16	Orthorhombic, 222 ( $D_2$ )	202
5.3.2.17	Orthorhombic, mm2 ( $C_{2v}$ )	205
5.3.2.18	Orthorhombic, mm2 ( $C_{2v}$ ), piezoelectric polymers	212
5.3.2.19	Monoclinic, 2 ( $C_2$ )	213
5.3.2.20	Monoclinic, m ( $C_s$ )	216
5.3.2.21	Triclinic, 1 ( $C_1$ )	217
5.3.3	Quadratic electrooptic coefficients	217
5.3.3.1	Cubic (isometric), m3m ( $O_h$ )	217
5.3.3.2	Cubic (isometric), (-4)3m ( $T_d$ )	222
5.3.3.3	Cubic (isometric), m3 ( $T_h$ )	222
5.3.3.4	Ceramics, $\infty m$ ( $C_{\infty v}$ )	223
5.3.3.5	Symmetry $\infty m$ ( $C_{\infty v}$ ), polymer sheet	226
5.3.3.6	Trigonal (rhombohedral), 3m ( $C_{3v}$ )	226
5.3.3.7	Trigonal (rhombohedral), 3 ( $C_3$ )	226
5.3.3.8	Tetragonal, 422 ( $D_4$ )	226
5.3.3.9	Tetragonal, (-4)2m ( $D_{2d}$ )	227
5.3.3.10	Tetragonal, 4mm ( $C_{4v}$ )	228
5.3.3.11	Orthorhombic, mmm ( $D_{2h}$ )	229
5.3.3.12	Orthorhombic, 222 ( $D_2$ )	229
5.3.3.13	Orthorhombic mm2 ( $C_{2v}$ )	230
5.3.3.14	Orthorhombic, mm2 ( $C_{2v}$ ), piezoelectric polymers	231
5.3.3.15	Monoclinic, 2 ( $C_2$ ) and 2/m ( $C_{2h}$ )	231
5.3.3.16	Monoclinic, m ( $C_s$ )	233
5.3.4	Indices of refraction and Sellmeier coefficients	233
5.3.4.1	Cubic (isometric), m3m ( $O_h$ )	233
5.3.4.2	Cubic (isometric), (-4)3m ( $T_d$ )	235
5.3.4.3	Cubic (isometric), m3 ( $T_h$ )	238

5.3.4.4	Cubic (isometric), 23 (T)	238
5.3.4.5	Hexagonal, 622 ( $D_6$ )	239
5.3.4.6	Hexagonal, (-6)m2 ( $D_{3h}$ )	239
5.3.4.7	Hexagonal, 6mm ( $C_{6v}$ )	240
5.3.4.8	Poled ceramics, $\infty m$ ( $C_{\infty v}$ )	241
5.3.4.9	Symmetry $\infty m$ ( $C_{\infty v}$ ), polymer sheet. Hexagonal, (-6) ( $C_{3h}$ )	242
5.3.4.10	Hexagonal, 6 ( $C_6$ )	242
5.3.4.11	Trigonal (rhombohedral), 32 ( $D_3$ )	244
5.3.4.12	Trigonal (rhombohedral), 3m ( $C_{3v}$ )	247
5.3.4.13	Trigonal (rhombohedral), 3 ( $C_3$ )	253
5.3.4.14	Tetragonal, 422 ( $D_4$ )	253
5.3.4.15	Tetragonal, (-4)2m ( $D_{2d}$ )	255
5.3.4.16	Tetragonal, 4mm ( $C_{4v}$ )	261
5.3.4.17	Orthorhombic, 222 ( $D_2$ )	263
5.3.4.18	Orthorhombic, mm2 ( $C_{2v}$ )	266
5.3.4.19	Monoclinic, 2 ( $C_2$ )	274
5.3.4.20	Monoclinic, m ( $C_s$ )	278
5.3.4.21	Triclinic, 1 ( $C_1$ )	279
5.3.5	Temperature coefficients	280
5.3.5.1	Temperature coefficients of the linear electrooptic coefficients $r$	280
5.3.5.1.1	Cubic (isometric), (-4)3m ( $T_d$ )	280
5.3.5.1.2	Trigonal (rhombohedral), 3m ( $C_{3v}$ ) and Tetragonal, 4mm ( $C_{4v}$ )	280
5.3.5.2	Temperature coefficients of indices of refraction	281
5.3.5.2.1	Cubic (isometric), (-4)3m ( $T_d$ )	281
5.3.5.2.2	Cubic (isometric), 23 (T)	281
5.3.5.2.3	Hexagonal, 6 mm ( $C_{6v}$ )	282
5.3.5.2.4	Hexagonal, 6 ( $C_6$ ) and Trigonal (rhombohedral), 32 ( $D_3$ )	282
5.3.5.2.5	Trigonal (rhombohedral), 3m ( $C_{3v}$ )	283
5.3.5.2.6	Tetragonal, (-4)2m ( $D_{2d}$ )	285
5.3.5.2.7	Tetragonal, 4 mm ( $C_{4v}$ )	287
5.3.5.2.8	Orthorhombic, 222 ( $D_2$ )	287
5.3.5.2.9	Orthorhombic, mm2 ( $C_{2v}$ )	288
5.3.6	Electrogyration	288
5.3.6.1	Cubic (isometric), m3 ( $T_h$ )	288
5.3.6.2	Cubic (isometric), 23 (T)	289
5.3.6.3	Hexagonal, 6/m ( $C_{6h}$ )	289
5.3.6.4	Hexagonal, 6 ( $C_6$ )	289
5.3.6.5	Trigonal (rhombohedral), 32 ( $D_3$ )	290
5.3.6.6	Trigonal (rhombohedral), 3 ( $C_3$ )	290
5.3.6.7	Tetragonal, 422 ( $D_4$ )	291
5.3.6.8	Tetragonal, (-4)2m ( $D_{2d}$ )	291
5.3.6.9	Tetragonal, 4/m ( $C_{4h}$ )	291
5.3.6.10	Tetragonal, (-4) ( $S_4$ )	291
5.3.6.11	Tetragonal, 4 ( $C_4$ )	292
5.3.6.12	Orthorhombic, 222 ( $D_2$ )	292
5.3.6.13	Orthorhombic, mm2 ( $C_{2v}$ )	292
5.3.6.14	Monoclinic, 2 ( $C_2$ ) and m ( $C_s$ )	293
5.3.7	Figures	294

5.4	Bibliography	331
5.4.1	Books and review articles	331
5.4.2	References	333
	Index of substances (See Vol. 30B)	
	Alphabetical index of element systems	
	Alphabetical index of names	