TABLE II. Literature values of single-crystal elastic constants of MgO, CaF_2, β-ZnS, ZnSe, and CdTe.[a]

Material and reference temperature (°K)	Density (g/cm³)	s_{11}	$-s_{12}$	s_{44}	c_{11}	c_{12}	c_{44}	A	Reference
		($\times 10^{13}$ cm²/dyn)			($\times 10^{-11}$ dyn/cm²)				
MgO (300)	3.576	4.024	0.936	6.461	28.93	8.77	15.477	1.54	36D1[b]
MgO (298)	3.580	(4.075)	(0.950)	(6.757)	28.60	8.70	14.80	1.49	55B1[a]
MgO (293)	3.598	3.983	1.000	6.349	30.20	10.10	15.75	1.57	61S1[c]
MgO (300)	3.579	4.029	0.942	6.468	28.94	8.82	15.46	1.54	63C1[d]
MgO (298)	3.579	(3.988)	(0.969)	(6.405)	29.708	9.536	15.613	1.55	65B1[e]
MgO (297)	3.581	4.004	0.973	6.428	29.60	9.51	15.557	1.55	65C1[f]
CaF_2 (300)	3.180	(6.904)	(1.479)	(29.586)	16.4	4.47	3.38	0.57	28V1[g]
CaF_2 (298)	3.180	(7.097)	(1.660)	(28.814)	16.44	5.02	3.47	0.61	55B1[a]
CaF_2 (0)	3.180	(6.818)	(1.515)	(25.000)	16.8	4.8	4.0	0.67	58S1[h]
CaF_2 (300)	3.1795	(7.241)	(1.768)	(29.674)	16.4	5.3	3.37	0.61	60H1[i]
CaF_2 (293)	3.1804	(6.901)	(1.463)	(29.481)	16.357	4.401	3.392	0.57	63H1[j]
β-ZnS (298)	4.102	(19.429)	(7.309)	(22.936)	9.42	5.68	4.36	2.33	18V1[k]
β-ZnS (298)	4.102	(19.995)	(8.016)	(24.272)	10.79	7.22	4.12	2.31	44B1[l]
β-ZnS (298)	4.102	(20.497)	(8.075)	(29.412)	10.0	6.5	3.4	1.94	51P1[m]
β-ZnS (302)	4.079	(18.817)	(7.090)	(22.173)	9.76	5.90	4.51	2.34	63E1[n]
β-ZnS (298)	4.088	(18.381)	(7.065)	(21.678)	10.46	6.53	4.613	2.35	63B1[o]
β-ZnS (293)	4.083	(18.706)	(7.201)	(21.645)	10.32	6.46	4.62	2.39	63Z1[q]
ZnSe (298)	5.262	(22.570)	(8.486)	(22.676)	8.10	4.88	4.41	2.74	63B1[o]
CdTe (298)	5.854	(42.542)	(17.338)	(50.151)	5.351	3.681	1.994	2.39	62M1[r]
CdTe (77)	5.860	(38.296)	(15.758)	(51.020)	6.15	4.30	1.96	2.12	63B1[o]

[a] Values in parentheses are the present writers' computation based on work of the original authors. The number of the significant figures does not necessarily represent the accuracy of the values.

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[e] 65B1: E. Hal Bogardus, J. Appl. Phys. **36**, 2504 (1965).

[f] 65C1: D. H. Chung (unpublished work, 1965).

[g] 28V1: W. Voigt *Lehrbuch der Kristallphysik*, (Teubner, Berlin, 1928), p. 744.

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[l] 44B1: S. Bhagavantam and D. Suryanarayana, Proc. Ind. Acad. Sci., **A20**, 304 (1944).

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[n] 63E1: N. G. Einspruch and R. J. Manning, J. Acoust. Soc. Am. **35**, 215 (1963).

[o] 63B1: D. Berlincourt, H. Jaffe, and L. R. Shiozawa, Phys. Rev. **129**, 1009 (1963).

[q] 63Z1: A. Zarembovitch, J. Phys. (Paris) **24**, 1097 (1963).

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the other from McSkimin's pulse-superposition method in the ultrasonic frequency range. Because of high damping, the resonance measurements on IR-CdTe were not made but instead sound velocities were measured by both the pulse-superposition and phase-comparison methods. The primary constants resulting from the resonance method are the shear and Young's moduli, whereas those from the ultrasonic methods are the shear and longitudinal moduli. In each case, the combined experimental errors in the modulus are indicated. It is noted here that the elastic moduli determined from the resonance method are always in the general agreement with the ones determined from the ultrasonic methods.

4. SINGLE-CRYSTAL ELASTIC CONSTANTS AND CALCULATIONS OF THE VOIGT-REUSS-HILL (VRH) MODULI

For most materials considered here, there are more than one set of single-crystal elastic constants reported in the literature and in some cases they differ in values from one author's result to another. This situation presents a problem of selecting the elastic constants realistic of the solid. For this reason, all the known values of elastic constants are quoted in Table II as they found in the literature. In each case, entries have been made for the reference temperature after the material heading and also for the density of the specimen used by the original author, the elastic constants, the elastic anisotropy factor, and the source of this information. Using these single-crystal data, the isotropic VRH moduli are calculated according to the relations

$$K_{\mathrm{VRH}}=K_V=K_R=K^*=c_{11}-2C/3 \qquad (1)$$

and

$$G_{\mathrm{VRH}}=G^*=(G_V+G_R)/2, \qquad (2)$$

where $C=(c_{11}-c_{12})$. The limiting moduli G_V and G_R are given by

$$G_V=C/5+3c_{44}/5, \qquad (3)$$

and

$$G_R=5Cc_{44}/(4c_{44}+3C), \qquad (4)$$