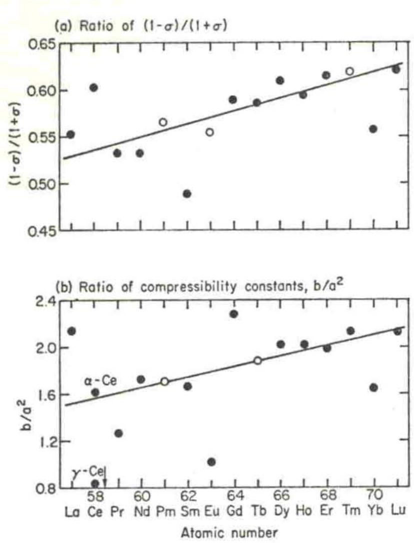

FIG. 25. (a) The ratio $(1 - \sigma)/(1 + \sigma)$ of the rare-earth metals. (b) The ratio of the compressibility constants, b/a^2, of the rare-earth metals. Open points are estimated values.

24. The Ratio of the Compressibility Constants, b/a^2

Slater[17] has shown that the Grüneisen constant can be calculated from the compressibility constants, a and b, of Eq. (6.1). (See Section 28 for further details concerning this calculation.) The constants appear in Slater's expression (Eq. (28.2)) in the form b/a^2. Furthermore, Slater[17] points out that b/a^2 is approximately a constant equal to about 2.5, and thus this ratio can be used to check on the validity of the compressibility measurements. That is, if the ratio of b/a^2 departs considerably from 2.5, the compressibility data should be suspected. For the above reasons the b/a^2 values listed in Table XXI were calculated from the compressibility constants a and b given in Table IV.

Examination of the data given in Table XXI reveals negative values for the ratio b/a^2 for ruthenium, γ-cerium, and tungsten. The negative values mean that the compressibility increases with increasing pressure, which is, in general, unlikely. Cerium, because it undergoes an electronic

TABLE XXI. RATIO OF THE COMPRESSIBILITY CONSTANTS, b/a^2

Element	b/a^2	Element	b/a^2	Element	b/a^2
3 Li	2.20	33 As	4.54	64 Gd	2.29
4 Be	4.11	34 Se	1.67	65 Tb	(1.88)[a]
5 B	2.13	37 Rb	1.57	66 Dy	2.02
6 C(g)	3.62	38 Sr	1.56	67 Ho	2.02
6 C(d)	(2.35)[a]	39 Y	1.98	68 Er	1.99
11 Na	1.85[b]	40 Zr	3.24	69 Tm	2.13
11 Na	1.79[c]	41 Nb	2.67	70 Yb	1.65
12 Mg	1.80	42 Mo	1.22	71 Lu	2.12
13 Al	2.63	43 Tc	(2.19)[a]	72 Hf	1.00
14 Si	2.48	44 Ru	−8.79	73 Ta	0.98
15 P(w)	(3.19)[a]	45 Rh	1.37	74 W	−0.97
15 P(r)	3.84	46 Pd	8.02	75 Re	(2.19)[a]
15 P(b)	2.47	47 Ag	0.35	76 Os	(2.19)[a]
16 S(r?)[d]	2.02[d]	48 Cd	2.77	77 Ir	5.25
16 S(r)	(1.94)[a]	49 In	2.26	78 Pt	0.72
19 K	1.96	50 Sn(g)	(2.35)[a]	79 Au	2.51
20 Ca	1.79	50 Sn(w)	2.52	80 Hg	(2.80)[a]
21 Sc	(2.20)[a]	51 Sb	2.47	81 Tl	2.17
22 Ti	2.71	52 Te	2.12	82 Pb	1.79
23 V	2.78	55 Cs	1.81	83 Bi	2.63
24 Cr	2.37	56 Ba	1.02	84 Po	(1.94)[a]
25 Mn	3.01	57 La	2.14	87 Fr	(1.84)[a]
26 Fe	2.35	58 Ce(α)	1.62	88 Ra	(1.54)[a]
27 Co	1.80	58 Ce(γ)	−5.60	89 Ac	(2.22)[a]
28 Ni	1.95	59 Pr	1.27	90 Th	3.03
29 Cu	3.60	60 Nd	1.73	91 Pa	(2.97)[a]
30 Zn	2.82	61 Pm	(1.71)[a]	92 U	4.70
31 Ga	(2.30)[a]	62 Sm	1.67	93 Np	(2.97)[a]
32 Ge	2.22	63 Eu	1.03	94 Pu	3.64

[a] Estimated value; see text for further discussion.
[b] Value obtained from parameters listed by Gilvarry[1] of Table IV.
[c] Value obtained from parameters listed by Beecroft and Swenson[6] of Table IV.
[d] See the text, Section 6, concerning the modification of Bridgman's sulfur.

transformation,[41] involving a large volume change ~13% at a moderately low pressure of 7720 kg/cm², may show an increase in compressibility with increasing pressure, because of some pretransformation. The compressibilities of ruthenium and tungsten cannot be so easily explained. Therefore, compressibility data for these two elements should be used with extreme caution. If the values in Table XXI are examined for other divergent ratios (assuming that those ratios greater than 4.17 or smaller than 0.83, i.e., $2.50 + (\frac{2}{3})2.50$, or $2.50 - (\frac{2}{3})2.50$, are divergent), we