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Revised Calibration for High Pressure Optical Bomb

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FOR the past several years a series of papers have been published with spectral measurements made on a high pressure optical bomb. Both the original calibration[1] and a later slight revision[2,3] were based on the observation of the phase transitions in AgCl and AgBr at 85 and 88

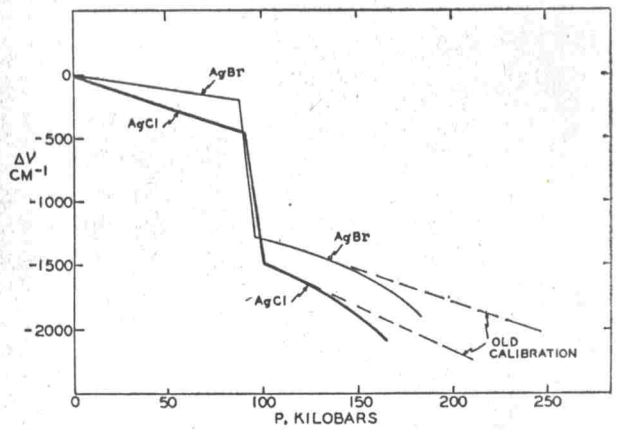

FIG. 1. Absorption edge versus pressure, AgCl and AgBr.

kilobars (see reference 4), plus the extrapolation of shifts of spectral peaks. These results were fitted to equations already published. The insulation of a piston to provide

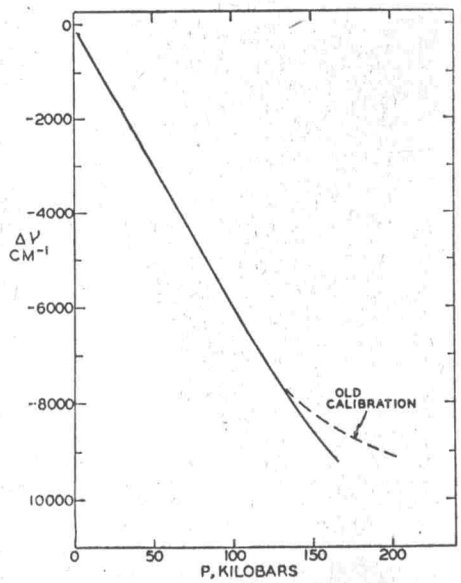

FIG. 2. Absorption edge of sulfur versus pressure.

for heating,[3] and the development of a high pressure electrical resistance cell[5] permits some cross-checking with electrical measurements. In particular, the bismuth transition observed by Bridgman[6] at 58 kilobars in his p.v. cell and at 78 kilobars electrically occurs at 58 to 60 kilobars. The high pressure transition observed by Bundy[7] electrically occurs at 88 to 91 kilobars on our scale.

Further observations, and a thorough study of the shifts of spectral peaks, indicate that the earlier correla. tions are substantially correct to about 140 kilobars-

TABLE I. Pressure calibration of ½-in. cell. Center pressure versus applied pressure at any central thickness.

Average applied pressure[a]	Center thickness (0.001 in.) 3.5	4	5	6	7	8	9	10	11	12
5.6	30.4	28.4	24.3	20.3	17.7	15.2	13.2	12.2	11.7	10.6
11.2	55.9	51.7	45.7	39.6	35.5	31.4	27.4	24.3	23.3	21.3
16.8	81.2	75.0	67.0	59.8	52.7	46.7	41.6	37.5	35.0	32.4
22.4	101.3	96.4	86.2	78.1	71.0	61.9	55.8	50.7	46.7	43.6
28.0	119.8	115.7	101.5	96.5	86.3	77.1	69.0	62.0	57.8	54.8
33.6	136.0	133.0	124.7	115.0	102.5	91.3	82.2	74.1	68.0	65.0
39.2	148.0	146.0	139.0	131.0	119.2	105.5	95.0	85.2	78.1	74.1
44.8	157.0	155.0	149.5	141.0	131.0	118.3	106.5	96.4	88.3	83.2
50.4	166.0	163.0	157.2	148.1	139.5	129.0	118.7	106.5	97.5	91.3

[a] All pressures in kilobars.

Above this pressure elastic and plastic deformation is more serious than we felt earlier, and a single equation does not fit the range. A revised calibration is presented in Table I. Since relatively few data have been presented above 140 kilobars, the results in the literature require little revision. Figures 1 and 2 present the recalculated shifts of the absorption edges of AgCl and AgBr (reference 2) and that of sulfur,[8] together with the original shifts (shown as dotted lines where they differ from the present correlation). These represent the largest deviations from previously presented results.

[1] R. A. Fitch, T. E. Slykhouse, and H. G. Drickamer, J. Opt. Soc. Am. **47**, 1015 (1957).
[2] T. E. Slykhouse and H. G. Drickamer, J. Phys. Chem. Solids **7**, 207 (1958).
[3] A. S. Balchan and H. G. Drickamer, Rev. Sci. Instr. **31**, 511 (1960).
[4] P. W. Bridgman, Proc. Am. Acad. Arts and Sci. **76**, 1 (1945).
[5] A. S. Balchan and H. G. Drickamer (submitted to Rev. Sci. Instr.).
[6] P. W. Bridgman, Proc. Am. Acad. Arts Sci. **74**, 425 (1942); **81** 165 (1952).
[7] F. P. Bundy, Phys. Rev. **110**, 319 (1958).
[8] T. E. Slykhouse and H. G. Drickamer, J. Phys. Chem. Solids **7**, 275 (1958).