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DISCUSSIONS

by A.W. Lawson

I would like to remark that relatively speaking, Professor Drickamer has not received overdue credit for his early entry into the field of superpressures. The wide scope of his activities, while not as flamboyant as some other activities, is quantitatively more interesting and deserves more attention. Recently, at The University of Chicago, we have analyzed his data on absorption of Fe^{++} ions in garnet. We have used a point ion model and Slater antisymmetrized wave functions. If we take Z_{eff} , in the Slater functions to be 20 per cent less than that given by Slater rules we are able to obtain agreement with Clark's data on absorption in almandine-pyrope only if the Si-O bands are very nearly 50 per cent covalent as originally suggested by Pauling. Under those conditions the agreement with Drickamer's measured pressure dependence is within experimental error. This result seems to justify Phillip's recent contention that the effect of distributed charge very nearly cancels the effect of repulsive terms in the potential as indeed do the curves Drickamer shows in his Fig. 12.

by D. Langer

The disadvantage of not having true hydrostatic pressure can not be avoided in your apparatus. For some measurements, however, and especially at lower temperatures this lack might be intolerable. For one of such cases D. Warschauer and myself developed a gas pressure generator. Optical measurements were done up to 16 kilobars at room temperature and up to 12 kilobars at 77°K. Electrical measurements could be done under true hydrostatic pressure up to 18 kilobars at room temperature and up to the freezing point of helium at 77°K. A description of this apparatus will be published in the Rev. Sci. Inst.

by William Paul

I would like to comment on the abscissa used for the display of the data. It is, of course, quite proper to display the experimental data as a function of pressure, and, at low pressures, this can be understood also as a plot against lattice constant. At the pressures reached by Dr. Drickamer, it seems likely that the compressibility is very different at the top pressures from that at atmospheric pressure; yet it is probably the lattice constant that is the more fundamental quantity in what theory exists for these effects. Thus, for example, the linear relation between gap and pressure found for silicon may convert into a non-linear one when compressibility corrections are applied. Since the gap variation in silicon at high pressures is often taken to be indicative of the change with pressure of the (100) energy band minima in group IV and group III-V semiconductors at all pressures, a compressibility correction is not trivial for attempted fits of theory and experiment.