OR

tion at 1100°C using dif-

a discrepancy of 2.5 kb be-
obtained using talc and silver
mediums, even after correc-
losses have been made. To
s into agreement, a further
% is needed for a two-stage
vith talc + boron nitride as
m.

Discussion

ates that at 35 kb and 1100°C
orrection of −11% is needed
mpression run, and this cor-
consist of two components.
is an irreversible component
d by hysteresis; it is attrib-
losses between the piston and
ne talc + boron nitride pres-
s correction amounts to −4%.
onent of pressure loss is re-

Determined

Khitarov [1964]	This Work
31.3	31.8 35.5

versible (i.e., it is not characterized by hysteresis) and is attributed to nonuniform distribution of stress in the pressure cell. This experimental work establishes the magnitude of this component as −7%. This nonuniform distribution of stress in the pressure cell is likely to occur even in the ideal case where there is no irreversible pressure loss due to wall friction. It is probably caused by the differences in strengths and compressibilities of the various components of the pressure cell (Figure 1). For example, the talc and boron nitride will have substantially greater strength than the graphite furnace and its internal components, especially since the graphite cylinder is much hotter than most of the volume of the talc and boron nitride cylinders. Hence the mean pressure on the end of the piston in contact with the base of the pressure cell is not necessarily the same as the actual pressure exerted on the sample in the middle of the pressure cell. It is this effect that causes the discrepancy between the results for the silver chloride pressure cell with negligible strength and the talc pressure cell with significant strength.

In Table 2 a comparison is given between the results of previous workers and the present results. Good agreement is obtained with Boyd and England's early, corrected results. This is to be expected because our apparatus is built from their design. We agree with their suggestion [*Boyd and England,* 1963] that the shear strength of the pressure medium decreases with increasing temperature but do not agree with their conclusion that a pressure correction is therefore no longer required. The pressure loss probably remains essentially independent of the run temperature because only a very small volume of the talc column, in the immediate vicinity of the hot spot, will be markedly affected by changes in run temperature. We have shown that, as well as an irreversible frictional pressure loss, there is also a reversible pressure loss due to the appreciable strength of the pressure cell.

The difference between the pressure correction for our piston-cylinder apparatus and Kennedy's apparatus we attribute to slight variations in design and dimensions and also to the different time factor involved in the experiments used to determine the pressure correction. Kennedy and co-workers used short-time melting experiments in their calibration. In our work, calibration experiments lasted an hour.

Good agreement with our corrected results and the Russian work is apparent (Table 2). We understand that the Russian apparatus is a two-piston-cylinder type, a piston entering each end of the cylinder. The friction and nonuniform distribution of pressure would probably be substantially smaller in such an apparatus than in the single-piston apparatus which we used.

Conclusion

Comparing our work at 1100°C and at pressures near 35 kb (pressure correction −11%) with Boyd and England's work at room temperature and in the approximate pressure range 20 to 40 kb (pressure correction −13%) [*Boyd and England,* 1960*b*] suggests that in the temperature range 0 to 1100°C a pressure correction of −11% on compression runs yields absolute pressures that are correct to within ±2% in the pressure range 20 to 40 kb. Since the effect of temperature on pressure loss appears to be comparatively small, the −11% pressure correction is probably applicable at temperatures well above 1100°C, but the uncertainty may be somewhat greater. Although Kennedy and co-workers worked under somewhat different physical conditions, their pressure correction is approximately comparable with our results in the same pressure range. Considering the results of all three investigations mentioned above, we believe that after applying a −10% pressure correction to a compression run at pressures greater than 15 kb we can expect an accuracy of ±3%.

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