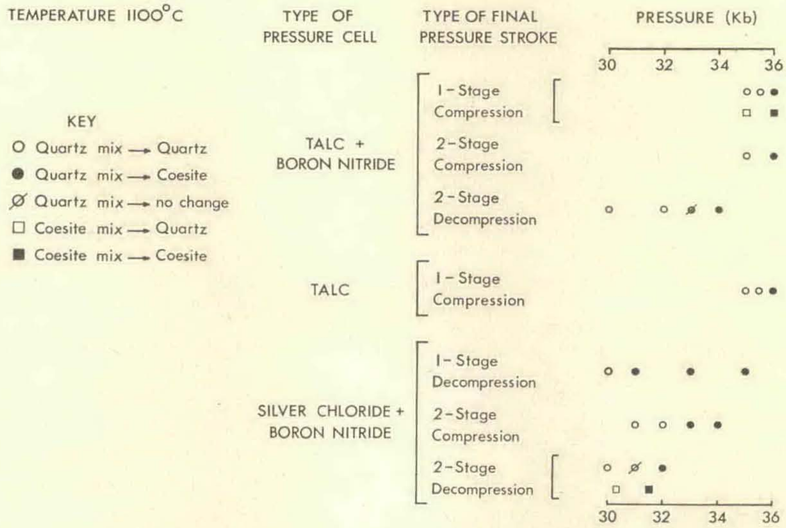


Fig. 2. Results of high-pressure runs on the quartz-coesite transition at 1100°C using different pressure cells.

the pressure vessel and to friction within the talc and boron nitride. It represents a −4% pressure correction to a two-stage compression run, and the quartz-coesite transition at 1100°C, using this correction, is placed at 34.3 kb.

With the silver chloride + boron nitride pressure medium for a two-stage compression run, the quartz-coesite transition at 1100°C occurs at a nominal pressure of 32.5 kb; in a two-stage decompression run it occurs at 31 kb. Thus the difference in pressure between compression and decompression results for the quartz-coesite transition is 1.5 kb. This is attributed to piston friction and to friction within the boron nitride, since friction losses in the silver chloride are considered to be negligible, and it represents a −2% friction correction to a two-stage compression run. The quartz-coesite transition at 1100°C, using this correction, is placed at 31.8 kb.

There remains a discrepancy of 2.5 kb between the results obtained using talc and silver chloride pressure mediums, even after corrections for friction losses have been made. To bring these results into agreement, a further correction of −7% is needed for a two-stage compression run with talc + boron nitride as the pressure medium.

## Discussion

This work indicates that at 35 kb and 1100°C a *total* pressure correction of −11% is needed on a two-stage compression run, and this correction appears to consist of two components. The first of these is an irreversible component being characterized by hysteresis; it is attributed to frictional losses between the piston and cylinder and in the talc + boron nitride pressure medium. This correction amounts to −4%. The second component of pressure loss is re-

TABLE 2. Quartz-Coesite Transition at 1100°C as Determined in Piston-Cylinder Apparatus

| | *Boyd and England* [1960*a*] | *Kitahara and Kennedy* [1964] | *Khitarov* [1964] | This Work |
|---|---|---|---|---|
| Corrected pressure, kb | 32.3 | 32.8 | 31.3 | 31.8 |
| Uncorrected pressure, kb | 35 | 35.3 | | 35.5 |

TABLE 1. Results of Runs on the Quartz-Coesite Transition at 1100°C

| Starting Material* | Type of Pressure Cell | Run Procedure | Nominal Pressure, kb | Time, min | Results |
|---|---|---|---|---|---|
| Q | T | One-stage compression | 35 | 60 | Quartz + trace coesite (≪4%) |
| Q | T | One-stage compression | 35.5 | 60 | Quartz |
| Q | T | One-stage compression | 36 | 60 | Quartz + almost equal coesite |
| Q | T + $BN_2$ | One-stage compression | 35 | 60 | Quartz |
| Q | T + $BN_2$ | One-stage compression | 35.5 | 60 | Quartz |
| Q | T + $BN_2$ | One-stage compression | 36 | 60 | Coesite + 50% quartz |
| C | T + $BN_2$ | One-stage compression | 35 | 60 | Quartz |
| C | T + $BN_2$ | One-stage compression | 36 | 60 | Coesite + trace quartz |
| Q | AgCl + $BN_2$ | One-stage decompression | 35 | 60 | Coesite |
| Q | AgCl + $BN_2$ | One-stage decompression | 33 | 60 | Coesite |
| Q | AgCl + $BN_2$ | One stage decompression | 31 | 60 | Coesite + 60% quartz |
| Q | AgCl + $BN_2$ | One-stage decompression | 30 | 60 | Quartz |
| Q | T + $BN_2$ | Two-stage compression | 35 | 60 | Quartz |
| Q | T + $BN_2$ | Two-stage compression | 36 | 60 | Coesite + 60% quartz |
| Q | AgCl + $BN_2$ | Two stage compression | 31 | 60 | Quartz |
| Q | AgCl + $BN_2$ | Two-stage compression | 32 | 60 | Quartz |
| Q | AgCl + $BN_2$ | Two-stage compression | 33 | 15 | Coesite + 70% quartz |
| Q | AgCl + $BN_2$ | Two-stage compression | 34 | 50 | Coesite |
| Q | T + $BN_2$ | Two-stage decompression | 30 | 60 | Quartz |
| Q | T + $BN_2$ | Two-stage decompression | 32 | 60 | Quartz |
| Q | T + $BN_2$ | Two-stage decompression | 33 | 60 | Quartz + trace coesite (4%) |
| Q | T + $BN_2$ | Two-stage decompression | 34 | 60 | Coesite + 60% quartz |
| Q | AgCl + $BN_2$ | Two-stage decompression | 30 | 60 | Quartz |
| Q | AgCl + $BN_2$ | Two-stage decompression | 31 | 60 | Quartz + trace coesite (<4%) |
| Q | AgCl + $BN_2$ | Two-stage decompression | 32 | 60 | Coesite |
| C | AgCl + $BN_2$ | Two-stage decompression | 30.5 | 60 | Quartz + 10% coesite |
| C | AgCl + $BN_2$ | Two-stage decompression | 31.5 | 55 | Coesite |

Q signifies mix composed of 94% quartz, 4% coesite, and 2% silicic acid.
C signifies mix composed of 90% coesite, 5% quartz, and 5% silicic acid.

1050°C, followed by final adjustment of pressure to the required value, and the procedure was completed with final adjustment of temperature to 1100°C.

3. Double-stage decompression. The pressure first applied was about 5 kb above the required value and then the temperature was increased to 1050°C. Release of pressure to the required value followed and finally the temperature was increased to 1100°C.

In this way the quartz-coesite equilibrium was approached from the quartz stability field (two-stage compression) or from the coesite stability field (two-stage decompression). At the conclusion of a run the sample was quenched by switching off the power to the furnace. The sample was then examined by optical and X-ray means, and the relative amounts of quartz and coesite were estimated.

## Results

The conditions and results of the runs are summarized in Table 1 and Figure 2. There is no difference between the results obtained using talc or talc + boron nitride as the pressure medium. Also there is no significant difference between single-stage and two-stage compression runs.

The quartz-coesite transition at 1100°C occurs at a nominal pressure of 35.5 kb in a two-stage compression run with a talc + boron nitride pressure medium and at 33.0 kb in a two-stage decompression run with the same pressure medium. Thus the difference in the pressure of the quartz-coesite transition between the two-stage compression and decompression runs is 2.5 kb. This is attributed to friction between the piston and the walls of