

was 1100°C at pressures greater than 30 kb, there was no significant melting of the silver chloride pressure medium. Some minor melting in the immediate vicinity of the 'hot spot' may have occurred. The nearness of the temperature to the melting point of the silver chloride would also reduce its strength and so improve it as a pressure-transmitting medium. Silver chloride pressure cells were made by melting the silver chloride, pouring it into a mold, and then machining it to the required dimensions (Figure 1c).

The quartz-coesite transition is rapid at 1100°C if some moisture is present, so that run times of an hour length are adequate. A great deal of work has been done recently on establishing the quartz-coesite curve with piston-cylinder and other apparatus, and adequate results are available for comparison.

The apparatus used is based on the design of Boyd and England [1960b], and the experimental procedure is similar to that described by Boyd and England [1960a, b] and by Ringwood and Green [1964]. Temperature is measured with a Pt|Pt-10Rh thermocouple. Temperature calibration of a normal assembly with

talc as the pressure medium showed that the temperature gradient in the space normally occupied by the specimen capsule is less than 5°C. In a normal run, once thermal equilibrium is reached, the temperature varies by approximately 5°C on either side of the control point. Hence temperatures are believed to have a precision better than  $\pm 10^\circ\text{C}$ . Oil pressure applied to the ram is measured with a Heise gage with a precision of better than 0.1%. The nominal pressure on the sample (i.e., assuming perfect transmission of applied pressure) is computed from the measured oil pressure, using the known cross-sectional areas of the piston and hydraulic ram.

The starting materials consisted of very finely ground mixes of either (1) 94% quartz, 4% coesite, and 2% silicic acid or (2) 90% coesite, 5% quartz, and 5% silicic acid. The coesite used in these mixes was prepared from silicic acid subjected to a temperature of  $900 \pm 60^\circ\text{C}$  and a pressure of 40 kb for 2½ hours. The first mix was used for most of the runs. A run was considered to be in the quartz field when the coesite had demonstrably disappeared and in the coesite field when the amount of coesite increased measurably. A few runs on the second mix demonstrated reversibility of the reaction.

Approximately 10 to 20 mg of undried sample was sealed in a platinum tube of wall thickness 0.015 cm. Three different ways of achieving the pressure-temperature conditions of a run were used:

1. Single-stage compression. The pressure was raised to the required value, then the temperature increased to 1100°C. This method resulted in final inward piston movement when used with talc (Figure 1a) and talc + boron nitride pressure mediums (Figure 1b). It was intended also to use it for the silver chloride + boron nitride pressure medium (Figure 1c), but when the temperature was increased, expansion of the assembly resulted in a pressure excess of 1 to 1½ kb, so that in actual fact the run was over-pressed and pressure had to be released. Thus, with the silver chloride, the single-stage application of pressure and temperature resulted in a decompression run.

2. Double-stage compression. The pressure was increased to about 2 kb below the required value. The temperature was then raised to

TABLE 1. Resu

Starting Material*	Type of Pressure Cell	
Q	T	One-s
Q	T	One-s
Q	T	One-s
Q	T + BN <sub>2</sub>	One-s
Q	T + BN <sub>2</sub>	One-s
Q	T + BN <sub>2</sub>	One-s
Q	T + BN <sub>2</sub>	One-s
Q	T + BN <sub>2</sub>	One-s
Q	AgCl + BN <sub>2</sub>	One-s
Q	AgCl + BN <sub>2</sub>	One-s
Q	AgCl + BN <sub>2</sub>	One-s
Q	AgCl + BN <sub>2</sub>	One-s
Q	T + BN <sub>2</sub>	Two-s
Q	T + BN <sub>2</sub>	Two-s
Q	AgCl + BN <sub>2</sub>	Two-s
Q	AgCl + BN <sub>2</sub>	Two-s
Q	AgCl + BN <sub>2</sub>	Two-s
Q	T + BN <sub>2</sub>	Two-s
Q	T + BN <sub>2</sub>	Two-s
Q	T + BN <sub>2</sub>	Two-s
Q	AgCl + BN <sub>2</sub>	Two-s
Q	AgCl + BN <sub>2</sub>	Two-s
Q	AgCl + BN <sub>2</sub>	Two-s
Q	AgCl + BN <sub>2</sub>	Two-s
C	AgCl + BN <sub>2</sub>	Two-s
C	AgCl + BN <sub>2</sub>	Two-s

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.

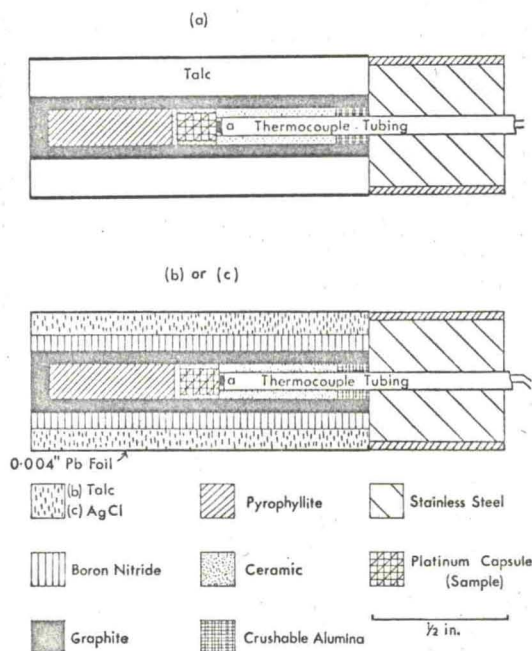


Fig. 1. Detail of types of pressure cells used in the calibration. Thermocouple junction, in contact with sample capsule.

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

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

In this way the quartz-coesite transition was approached from the quartz stability field (two-stage compression) or from the coesite stability field (two-stage decompression). The conclusion of a run the sample was then examined by switching off the power to the sample and the relative amounts of quartz and coesite were estimated.