d closely to proin certain shear curves <sup>10</sup>).

relative to the tudy. The prepad orientations of e samples ranged nm with lateral

nge in ultrasonic re for each of the propagate in each ions was carried arison technique tion is as follows:

$$\left|\frac{r_0/2\pi}{r/2\pi}\right|$$
, (1)

to be determined ive to a reference sured at 298° K. orresponds to n aple thickness of K. Disregarding ckets, V at any btained from a ling to the same were present at of t, the specimen e, using existing uantity in square ige in the phase  $\gamma/2\pi$  being the account for the ng material. The escribed by Mceasurements this riew of the very rom the relative ve trains.

## 2.3. MEASURING APPARATUS

With exception for the coupling cement, the apparatus used for the measurements was precisely the same as described in <sup>10</sup>) for measurements above 300° K. The sample was separated vertically from the piezoelectric transducer by a 20 to 25 mm long fused silica buffer rod. A very thin layer of phenolic resin paste, described in <sup>12</sup>), was used to couple the sample acoustically to the buffer rod. Contrary to the information given in <sup>12</sup>), the present experiments have shown that this cement can propagate both longitudinal and transverse waves up to temperatures of 923° to 933° K.

The measurements of  $f_n$  were carried out in the range of 35 to 45 mc/sec for both types of waves. The recorded temperatures were obtained from a chromel-alumel thermocouple with the hot junction located about 3 to 4 mm from the specimen but in contact with the fused silica buffer. Since errors of 2° or 3° K were possible because of natural thermal gradients in the heated zone and fluctuations in the controlling temperatures it was deemed advisable to limit the temperatures of measurement to  $928^{\circ}$  K, so as to insure against destroying the single crystal character of the samples by the  $\alpha \rightleftharpoons \beta$  transformation. In the early stages

Table 1

Temperature ranges at which attenuation of ultrasonic waves prevented measurement of wave velocities  $\rho = \text{density}$  V = wave velocity

Crystal Designation	Direction of wave propagation	Type of mode and shear polarization	Stiffness modulus	Temperature ranges of missing data, (° K)
A, A'	100	Long. Shear, [010] Shear, [001]	C <sub>11</sub> C <sub>66</sub> C <sub>55</sub>	above 325 600–825
В, В'	010	Long. Shear, [100] Shear, [001]	C <sub>22</sub> C <sub>66</sub> C <sub>44</sub>	580–650, above 850 above 340 above 375
C	001	Long. Shear, [010] Shear, [100]	C <sub>33</sub> C <sub>44</sub> C <sub>55</sub>	very weak (825–835) above 825
D	$\theta_T \sim 45.5^{\circ}$ to [001], 90° to [010]	Quasi-long.  Quasi-shear,  [h0l]  Pure shear,  [010]	$arrhoV^2_{ m D}$ $arrhoV^2_{ m DPS}$ $arrhoV^2_{ m DPS}$	above 750
E	$ heta_{ extsf{E}} \sim 38^{\circ}$ to [001], 90° to [100]	Quasi-long.  Quasi-shear, $[0kl]$ Pure-shear, $[100]$	$arrho V^2_{ m E}$ $arrho V^2_{ m ES}$ $arrho V^2_{ m EPS}$	above 300 above 300
F	$ heta_{ m F}$ $\sim 44.5^\circ$ to [100], 90° to [001]	Quasi-long. Quasi-shear, [hk0] Pure-shear, [001]	$arrho V^2_{ ext{F}}$ $arrho V^2_{ ext{FS}}$ $arrho V^2_{ ext{FPS}}$	740–860 700–823