ers on diamond is poor. The most recent work by Poindexter (1), however, is probably the most accurate.

As is to be expected, the numerical values of the respective constants of diamond and silicon differ. Of more pointed interest, however, is the piezobirefringent anisotropy, that is, the difference between $(q_{1111}-q_{1122})$ and q_{1212}. Although Ramachandran's values indicate a significant anisotropy, those reported by Grodzinski and Poindexter show only a small difference in value for the two piezobirefringence constants. It should be

TABLE 2. TABULATION OF PIEZOBIREFRINGENCE MEASUREMENTS OF DIAMOND BY DIFFERENT INVESTIGATORS AND OF SILICON

Material	Worker	Wavelength	$(q_{1111}-q_{1122})$*	$2q_{1212}$*
Diamond	Wertheim (13)	?	—3.3—	
Diamond	Ramachandran (14)	5461 Å	− 7.2	− 2.8
Diamond	Grodzinski (15) and Fisher	(Not reported)	− 3.85	− 3.78
Diamond	Poindexter (1)	5400 Å	− 3.04	− 2.98
Silicon	(This paper)	11100 Å	−14.4	−10.0

* Expressed in units of $\times 10^{-14}$ cm.^{2}/dyne.

noted, however, that the magnitude of $(q_{1111}-q_{1122})$ reported by all workers on diamond (except Wertheim) is consistently greater than $2q_{1212}$. This agrees with the presently observed values for silicon. Silicon, however, shows a marked piezobirefringent anisotropy.

The fact that silicon has been studied very close to the absorption cutoff may be related to the observed difference in anisotropy between diamond and silicon. Most past work on diamond has been carried out at an average wavelength of 5400 Å. Poindexter has investigated the piezobirefringent dispersion of $2q_{1212}$ as a function of wavelength from 4400 Å to 7700 Å. His results show a slight dispersion amounting to approximately 4% in this wavelength range. No study has been made on the dispersion of $(q_{1111}-q_{1122})$.

Diamond may possess a piezobirefringent anisotropy at the absorption edge in the ultraviolet region of the spectrum which is comparable to that observed in silicon at 1.11 μ. The wavelength relationship of both piezobirefringence constants of diamond should be investigated to approximately 3000 Å. Similarly, silicon should be studied further into the infrared.

CONCLUSIONS

The following values have been determined for the piezobirefringence constants of "high purity" silicon at a wavelength of 1.11 μ and a temperature of 26° C. ± 1°:

$$(q_{1111} - q_{1122}) = -14.4 \times 10^{-14} \text{ cm.}^2/\text{dyne}$$
$$2q_{1212} = -10.0 \times 10^{-14} \text{ cm.}^2/\text{dyne}$$

The linearity of the stress-induced retardation described by both constants has been established up to pressures of approximately 450 kg./cm.^{2} The observed significant piezobirefringent anisotropy of silicon in the vicinity of its absorption cutoff indicates the possibility of greater anisotropy for diamond at its absorption cutoff (~3000 Å). Qualitative observations indicate that silicon becomes a uniaxial negative crystal under a directional stress parallel to [100].

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