A. L. Jain†
R. L. Jaggi†

Piezo-Resistance and Piezo-Hall Effect in Bismuth*

The electrical resistivity and Hall coefficient in single crystals of bismuth have been measured as a function of uniaxial stress along the trigonal axis at 4.2°, 77°, and 295°K. The data are analyzed in terms of a two band model to determine the deformation potential components E_1 and E_2 given by $\delta E_0 = E_1(\epsilon_{11} + \epsilon_{22}) + E_2\epsilon_{33}$, where E_0 is the overlap energy. By combining the results of the present experiment with the measurements of the pressure dependence of the galvanomagnetic effects[1] and the value $E_0 = 0.027$ eV, we find $E_1 = -2.4$ eV and $E_2 = +2.5$ eV.

† IBM Zurich Research Laboratory.
* A summary.

Reference

1. R. Jaggi, A. L. Jain, and H. Weibel, *Physics Letters* 7, 181, (1963).

Discussion

J. K. Galt: Could you compare the deformation potentials obtained with those in other materials?

S. H. Koenig: One can make a plot, versus electron density, of deformation potentials of various materials. They start at ~20 eV for typical semiconductors at one end and go down to volts or fractions of a volt for weakly metallic solids like zinc. I think on this plot bismuth should be of order one volt. People have been assuming values ~1 eV to estimate things like ultrasonic attenuation in bismuth. I think a value 3 eV for bismuth is no surprise, but is perhaps a factor of three higher than what had been previously thought.

B. S. Chandrasekhar: It should be remarked that the change of the sign of the deformation potential on going from the trigonal plane to the trigonal axis is consistent with the change of the sign of the magnetostriction on going from one of these directions to the other, as has also been pointed out by R. W. Keyes.