$E(\Gamma_6) > E(\Gamma_8)$ for HgSe and $E(\Gamma_8) > E(\Gamma_6)$ for HgTe. As stated in the earlier report,[13] this result for HgSe was unexpected.

At this point in this incomplete investigation, two new results of pressure experiments should be reported. From the first result it is concluded that experimental data are needed to establish whether or not the samples previously used were extrinsic. From the second result, which is obtained from an optical pressure experiment, it is suggested that the ordering $E(\Gamma_8) > E(\Gamma_6)$ is appropriate for HgSe; this conclusion is opposite to that obtained from thermoelectric power measurements.

In the first of these experiments, thermoelectric power vs pressure measurements were made on HgSe samples with electron concentrations between 5×10^{17} and 3×10^{18} cm^{-3}. Since the last report a measurement of the Hall coefficient vs pressure for a sample of HgSe with 5×10^{17} electrons/cm^3 has shown a change of 10 percent in 6 kilobars. For this concentration, then, the extrinsic condition, which would give a zero Hall coefficient change with pressure, does not hold. Piotrzkowski et al.[14] claim that the Hall coefficient is independent of pressure for their HgTe, with 1×10^{18} electrons/cm^3, which shows a decrease of $|\alpha|$ with pressure. This is about the heaviest doping of HgSe for which a definite change of α with pressure can be detected. Thus, a comparison of the Hall coefficient vs pressure behavior for HgSe and HgTe with 1×10^{18} cm^{-3} carriers is at least necessary before there can be confidence in the simple interpretation of the thermo-electric power vs pressure results.

The second pressure experiment has been performed by Dr. W. M. DeMeis of Harvard. He has measured the pressure dependence of the absorption edge in heavily doped n-type HgSe and HgTe (the absorption edge corresponds to transitions from the top of the valence band to the Fermi level in the conduction band). The results for both materials can be explained by assuming a pressure coefficient of 12×10^{-6} eV/bar for the $\Gamma_6 - \Gamma_8$ energy gap and the energy ordering $E(\Gamma_8) > E(\Gamma_6)$. The pressure coefficient of this gap is empirically known to fall in the range 9 to 15×10^{-6} eV/bar for the diamond and zinc blende semiconductors. If, on the other hand, HgSe has the ordering $E(\Gamma_6) > E(\Gamma_8)$ and a valance band maximum not at $\vec{k} = 0$, then a pressure coefficient about half of that given above is needed to obtain a zero or negative thermal energy gap; this falls outside the usual range of coefficients for this gap. Although the results of this experiment, then, do not conclusively establish the ordering of levels at $\vec{k} = 0$ in HgSe, they add to the list of indirect evidence which favors the $E(\Gamma_8) > E(\Gamma_6)$ band structure.

S. H. Groves

7. Analysis of Shubnikov-de Haas Results for HgSe

Whitsett[15] has made a thorough experimental study of the Shubnikov-de Haas (SdH) effect in n-type HgSe. An important first result of his work is that the stoichiometry of HgSe can be varied to give 1×10^{17} to 5×10^{18} homogeneously distributed electrons per cm^3. Thus, it is probably the best n-type zinc blende material in which to study the SdH effect.

Secondly, by measuring the temperature dependence of the oscillation amplitudes, Whitsett found the effective mass at the Fermi level for various concentrations and was able to assign values to the two parameters which are most important for the conduction band curvature: $|E(\Gamma_8) - E(\Gamma_6)|$ and the momentum matrix element P between these states.