Jamieson (11) has shown that the structure is the same as white tin, so that the transition is quite analogous to the well known grey tin-white tin transformation.

Silicon shows a small continuous drop in resistance with pressure in the low pressure phase. Again this is consistent with measurements on the shift of the absorption edge (9). At 190-195 kilobars there is a very large drop in resistance. The high pressure phase is metallic and has the white tin structure.

Figure 8 shows resistance-pressure curves for ZnS, ZnSe and ZnTe (12). The sulfide and selenide have very high resistances in the low pressure phase, so that the dotted lines show merely the resistance of the cell. The ZnTe curve is, again, consistent with optical measurements (13). For each of these there is a transition accompanied by a very large drop in resistance. These transitions occur at 135, 165 and 240 kilobars respectively. In each case the high pressure phase behaves as a metal (10). Recent unpublished X-ray measurements indicate that ZnTe, ZnSe and possibly ZnS have the simple cubic CsCl structure at high pressure. Thus we see that it is possible for a single material to behave as an insulator, a semiconductor, or a metal, depending on the interatomic spacing. The transformation may take place continuously, or accompanied by a first order phase transition.

Electronic Transitions in Metals

As discussed in the introduction to this paper, the normal effect of pressure on the electrical resistance of a metal is to cause a modest decrease in resistance due to the stiffening of the lattice. There are a variety of exceptions to this rule. It is of interest to discuss one class of exceptions which illustrate again a case where pressure is a unique tool for investigating electronic structure.