resistance change for a given pressure level is generally greater for shock compression than for hydrostatic compression. Agreement among results of different experimenters is not good. Material history has been shown to be important but few attempts have been made to do experiments on well-characterized material. Good experiments require good shock-impedance match between metal and anvil, geometry that assures uniaxial compression, elimination of perturbations by electrical leads, and well-characterized initial condition of the metal. In addition, careful analysis is necessary to subtract out the thermal effects occurring in shock compression so that comparison can be made to hydrostatic experiments and theories.

In the present experiments, electrical resistance changes in silver foils were monitored during uniaxial compression by shock waves; foils were 15 to 25 micrometers thick. Electrical resistance of silver under hydrostatic compression has been measured by Bridgman (1952), but no previous studies on silver resistance under shock compression have been published.

Pressure levels in the silver ranging from 25 to 120 kilobars (1 bar = 1 atmosphere) were generated by high-velocity impact; shock duration was 0.5 microseconds. The voltage drop across the foil due to 150 amperes of current was monitored during this time. In several cases, foil fragments were recovered after the experiment and examined by microscopy and isothermal annealing studies.

The present work also involved several types of analysis. Using a Debye model of a solid, a method was developed for computing isothermal resistivity as a function of volume. When a single parameter is adjusted to experimental results, the computation agrees closely with the experiments of Bridgman to 30 kbar. This method was also used to correct shock resistivity data to isothermal conditions. The deviation between isothermal data from uniaxial shock compression and calculated hydrostatic results is attributed to the resistivity of lattice imperfections generated by plastic deformation in the shock wave. A speculative model was developed to explain the high lattice defect concentration found and its dependence on silver purity.

The purpose of this paper is to present experimental results on shock resistivity of silver foils, to put the isothermal analysis on a firm footing, to consider all possible effects on the resistivity, and to establish the credibility of the shock-generated defect concentrations deduced.

Presentation will begin with description of experimental design and procedure. Then analyses needed to reduce acquired data to meaningful forms are described. Results of the experiments and data reduction are presented next, along with discussion of the physical content of the data. Finally, conclusions and recommendations are presented.

In summary, by careful experimental design and sample preparation, accurate, reproducible resistance measurements during shock compression were accomplished. Shock isothermal resistivity is found to be significantly higher than hydrostatic resistivity at a given pressure. The deviation is attributed to resistivity of point defects generated by uniaxial shock