# I. INTRODUCTION

A traditional good way of studying material behavior is to monitor some material property while varying a thermodynamic parameter, such as temperature or pressure, and compare results to theoretical predictions. Temperature is varied more often than pressure because it is easier to modify and control, while electrical resistivity is a material property often studied since it is relatively easy to measure.

Measurements of resistance of crystalline materials as a function of pressure can tell us something about properties of the ideal lattice and of the lattice imperfection. Changes in the ideal lattice which will affect resistivity include changes in electron band structure and changes in electron coupling with the lattice vibration spectrum; theory exists for comparison with experimental results (Paul, 1963; Bridgman, 1952). Changes in number and types of imperfections will affect electron scattering and hence resistivity. Lattice imperfection changes are often monitored by precise measurement of resistivity changes of materials which have been rapidly quenched from temperatures near the melting point while maintaining the system at a high hydrostatic pressure. Activation volume of formation, identifying the dominant type of defect present, and equilibrium concentrations of vacant lattice sites (vacancies) as a function of pressure are obtained (Emrick, 1972; Emrick and McArdle, 1969; Huebener, 1965). We see then that measuring resistivity while varying pressure is important to understanding material behavior.

Effects of material history on resistance changes due to transient high pressure generated by shock waves have been noted but there has been no systematic attempt to compare results with static high pressure results or to theory so that properties of lattice defects under dynamic pressure might be studied. Dynamic data are expected to be different from static data due to generation of lattice imperfections by plastic deformation by uniaxial shock compression. In a truly hydrostatic compression of an isotropic solid there is no plastic deformation, only a change in lattice parameter. Evidence for the defect generation in shock experiments on metals is found in a number of metallurgical and annealing studies which have been done on metals which have been shocked for a short duration and relieved back to atmospheric pressure (Kressel and Brown, 1968; Mahajan, 1970; van Wely, 1968). While many of the defects generated by the shock wave will have annihilated or migrated out before examination, these studies indicate some of the effects of different shock strengths and initial conditions on the point and line imperfection densities and configurations generated. The generation of these imperfections will affect resistance changes observed in a shocked metal.

Shock-induced resistance changes have been measured for copper, iron, nickel, and ytterbium, as well as manganin alloy (Ginsberg and Grady, 1972; Styris and Duvall, 1970). Fractional