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* Work supported by Air Force Weapons Laboratory, Albuquerque, New Mexico.

DE 3. Shock Compression of Iron Silicate Garnet. E. K. Graham and T. J. Ahrens, Calif. Inst. Tech.--Shock Hugoniot data for a natural almandine garnet have been obtained to 300 kbar. The samples were cut from a large single crystal of uniform composition containing approximately 80 mol percent $Fe_3Al_2Si_3O_{12}$. Compression was measured in the [100] direction. An elastic precursor of approximately 100 kbar amplitude and velocity 8.4 km/sec was observed. This is somewhat lower than the compressional elastic wave velocity measured in the samples using ultrasonic techniques. The final Hugoniot states agree closely with the static isothermal compression data of Liu and Takahashi (1970), obtained for a garnet of almost identical composition, using a diamond anvil apparatus. However, the shock Hugoniot and X-ray compression data in the 200-300 kbar range indicate compressions significantly greater than that predicted by the ultrasonic data of Soga (1967) using the Murnaghan equation.

DE 4. Optical properties of MgO during shock. E. S. Gaffney and T. J. Ahrens, Calif. Inst. Tech.--The refractive index and optical transmission characteristics of single crystal MgO have been determined under shock pressures up to 410 kbar. At 410 kbar the refractive index of MgO (density = 4.26 gm/cc) is 1.795 ± 0.033. This value is significantly lower than the value extrapolated from the zero pressure index by either the Drude law (n = 1.84) or the Lorentz-Lorenz law (n=1.88). There is a small decrease in the intensity of light reflected from behind the shock front which may be due to a number of causes. The characteristics of a high intensity point light source similar to that of Preonas and Swift (1970) and its application to other optical experiments in shocked dielectrics (e.g., optical absorption spectroscopy) is discussed.

DE 5. Abstract Withdrawn.

DE 6. The Effect of Valence Electron-Core Polarization on the Equation of State of Copper. D. JOHN PASTINE, NOL, White Oak-The Wigner-Seitz technique has been used to calculate the 0°K isotherm of copper to a relative compression of 15%. The calculations are purely theoretical and include the effects of valence electron-core exchange and polarization. The results indicate that the polarization interaction may account for most of the observed cohesive energy and bulk modulus of copper. The introduction of this interaction greatly improves the agreement between theory and experiment.

DE 7. Critical Point of Metals from the van der Waals Theory.* D. A. Young and B. J. Alder, Lawrence Radiation Laboratory, Livermore.--The classical van der Waals model of fluids is modified by a more accurate equation of state for hard spheres. The hard sphere diameter and the van der Waals constant a are obtained from experimental data. The model is used to predict the critical constants of metals, as well as the equation of state, cohesive energy, and coexistence curves near the critical point. Of the three critical constants, the critical temperature is most accurately predicted, being within a few percent of experiment for alkali metals.

* Work performed under the auspices of the U.S. Atomic Energy Commission.

DE 8. Shock Hugoniots of LiF and NaCl. G.E. HAUVER and A. MELANI, Ballistic Research Laboratories.--Hugoniot data for single-crystal LiF and NaCl have been obtained and compared with data of other investigators. There is substantial agreement with existing LiF data, but the additional data provide evidence of a discontinuity in the U,u (shock velocity, particle velocity) relationship for the (100) orientation near 420 kbar, and suggest the presence of a phase transition. The Hugoniot is represented by $U = 5.063 + 1.429u$ ($0.52 \le u \le 2.03$), and by $U = 4.601 + 1.533u$ ($2.29 \le u \le 3.75$), with $\rho_o = 2.637$ g/cc. Hugoniot data for NaCl in the pressure range from 90 to 700 kbar are in substantial agreement with existing data except between 320 and 460 kbar where a significant deviation occurs. This deviation is just above the transition from NaCl to CsCl structure, and suggests an influence by the transition. Lateral relaxation measurements on the (111) orientation provide evidence of the transition at 200 to 208 kbar, which is slightly below the pressure where the transition is detected in a U,u representation of data. Data for the NaCl structure are represented by $U = 3.435 + 1.430u$, with $\rho_o = 2.161$ g/cc. Above the transition, from 460 to 700 kbar, the data are represented by $U = 2.131 + 1.730u$.

DE 9. Comparison of Static and Dynamic Compressibility of Solids.* R. Grover, Lawrence Radiation Laboratory, Livermore.--An intercomparison of shock wave compression data on normal metals, alkali metals and alkali halides is made with recent static high pressure[1] and sonic compressibility data. Although the compressibilities and their pressure derivatives obtained from separate fits to static and dynamic data may differ by as much as 10-20% it is found that the compression curves ΔV vs P, agree to better than experimental errors of, ~5% after taking account of known phase transitions. A notable exception is the case of the alkali metals, Rb in which the Hugoniot lies below the statically measured isotherm in the vicinity of 50 kbar. The extremely high shock temperatures (>2000°K) may be thermally inducing an electronic phase transition analogous to the 50 kbar Cs transition in the solid phase.

[1] S. N. Vaidya, G. C. Kennedy (to be published).

* Work performed under the auspices of the U.S. Atomic Energy Commission.