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* Work supported by Air Force Weapons Laboratory,
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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 Abstract Withdrawn.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 Radia-
tion 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 equa-
tion of state, cohesive energy, and coexistence curves
near the critical point. Of the three critical con-
stants, 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 repre-
sented by U = 5.063 + 1.429u (0.52≤u≤2.03), and by
U = 4.601 + 1.533u (2.28≤u≤3.75), with ρ_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 dev-
iation occurs. This deviation is just above the trans-
ition from NaCl to CsCl structure, and suggests an in-
fluence by the transition. Lateral relaxation measure-
ments 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 ρ = 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 Compressibil-
ity of Solids.* R. Grover, Lawrence Radiation Labora-
tory, 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 compres-
sibilities 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 er-
rors of, ~5% after taking account of known phase tran-
sitions. A notable exception is the case of the alkali
metals, Rb in which the Hugoniot lies below the stati-
cally measured isotherm in the vicinity of 30 kbar.
The extremely high shock temperatures (>2000°K) may be
thermally inducing an electronic phase transition anal-
ogous 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.