...as are negligible compared to the anion. Therefore, "block-... of laser pump light by the cations does not take place to ...important extent.

...he absolute quantum efficiency of the piperidinium salt ...M in acetonitrile, irradiated with 3150 Å light) has been ...sured by comparison with rhodamine B as a standard[3,4] ...found to be 0.75±0.15. The ratio of the quantum efficiency ...e quinolinium to the piperidinium salt solution is, however, ...0.65. At room temperature about 95% of the total fluorescence ...both solutions occurs near 6120 Å in the $^5D_0 \rightarrow {}^7F_2$ transition ...acteristic of Eu^{+3}.

...he possible reason for the lower quantum efficiency of the ...olinium salt solution involves quenching of the anion emis... by interaction with the quinolinium ion. If such a process is ...ative, one would expect the quantum efficiency to decrease ...the concentration of the chelate salt in solution is increased. ...ever, while the quantum efficiency of the piperidinium salt ...ained constant on increasing the concentration from 5×10^{-3} to ...10^{-1} M, that of the quinolinium salt increased about 18%. This ...lt indicates that such a quenching process is not taking place. ...n alternate explanation for the lower quantum efficiency of the ...olinium salt, which is consistent with the observed results, ...be given in terms of the dissociation of the chelate anion, ...ction 1.

$$Eu(BTF)_4^- \rightleftharpoons Eu(BTF)_3 + BTF^- \qquad (1)$$

...e quantum efficiency of the electrically neutral tris chelate ...BTF)$_3$ in acetonitrile is only about $\frac{1}{10}$ that of PEu(BTF)$_4$ ...ations. Any dissociation according to (1), therefore, results ...lower over-all quantum efficiencies.

...since the $^5D_0 \rightarrow {}^7F_2$ emission band for Eu(BTF)$_3$ occurs at ...rly the same wavelength as for PEu(BTF)$_4$, the presence in ...ation of Eu(BTF)$_3$ is more easily detected by means of much ...ker $^5D_0 \rightarrow {}^7F_0$ emissions. Figure 1 shows this portion of the ...rescence spectrum for solutions made up from PEu(BTF)$_4$, ...BTF)$_3$, and QEu(BTF)$_4$, where Q is the quinolinium ion. ...m the nearly symmetrical shape of the main peak of curve (a) ...f the relative intensities of curves (a) and (b), the amount of ...BTF)$_3$ in the solution prepared from PEu(BTF)$_4$ is found to ...less than 10% of the total europium present. Curve (c), ...wever, shows an asymmetry which we attribute to the presence ...appreciable Eu(BTF)$_3$.

...If f represents the fractional dissociation of tetrakis molecules ...the quinolinium solution and r the ratio of the intensity of the ...$\rightarrow {}^7F_0$ emission from tris molecules in the quinolinium solu... (c) to that from the pure tris solution (b), we have[5]

$$r = 3/4f. \qquad (2)$$

...nstructing curve (c) from the sum of two appropriate curves of ...pe (a) and (b), we find f to be equal to 0.40.

The greater amount of Eu(BTF)$_3$ observed in solutions pre...ed from QEu(BTF)$_4$ suggests that the quinolinium ion facili...es the dissociation of $Eu(BTF)_4^-$. We postulate, as one possible ...chanism, that this is the result of ion pairing according to ...ction (3). To the extent that

$$Q^+ + BTF^- \rightleftharpoons Q(BTF), \qquad (3)$$

...occurs, BTF^- is removed from solution and equilibrium (1) ...hifted to the right.

In summary, the results presented here show that the cation in ...salt BEu(BTF)$_4$ can be important in determining the laser ...abilities of solutions containing the salt without interacting ...ctly with the lasing species $Eu(BTF)_4^-$ to change its spectral ...perties.

...Work partially supported by Project DEFENDER under joint ...orship of ARPA, ONR, and DOD under Contract Number Nonr-...00).

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Shock-Wave Compression of Germanium from 20 to 140 kbar*

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(Received 12 July 1965)

THE object of this note is to report stress–volume results between 20 and 140 kbar for germanium, shock loaded in a state of one-dimensional strain along the [111] crystallographic direction. Resistance–time measurements, made while the shock wave traverses the sample, circumvent difficulties inherent in the usual free surface velocity methods.

Shock loading was accomplished by impacting large diameter-to-thickness ratio disks of germanium upon each other in order to ensure a state of one-dimensional strain in all but the periphery of the disks for the duration of the experiment. One disk, mounted on the face of a projectile, was accelerated to a measured high velocity by means of a compressed gas gun[1] and was impacted in vacuum upon the specimen disk mounted on the end of the gun. Angular misalignment between the impacting surfaces was about 5×10^{-4} rad.[2] Germanium back-up disks were mated to the rear of the specimen. The thicknesses of the impact and back-up disks were chosen so that the stress waves propagated through and out of the specimen disk without reflection until, finally, the specimen was stressed uniformly to the impact value for a brief interval preceding the arrival of unloading waves.

The disks, 38 mm in diameter, were cut from single crystals of high purity n-type germanium of nominal 50-Ω·cm resistivity and were oriented with their faces parallel to a (111) crystal plane. Their dislocation density was approximately $6\times10^3/cm^2$. Depending on the particular experiment, the thicknesses of the specimen disks were 3.2, 4.0, and 8.0 mm.

The resistance–time history resulting from stress waves propagating through the specimen was obtained by recording the voltage–time history across the thickness of the specimen disk under constant current conditions. The constant current of one ampere was applied to the specimen disk about 500 nsec before impact to prevent resistive heating of the disk. Both faces of the disk were entirely electroless nickel plated to provide Ohmic electrodes. The impact surface electrode of the specimen was also coated with vapor deposited silver and maintained at ground potential. The back-up disk assembly, entirely vapor coated with silver, served as the circuit lead to the other electrode.

For impact stresses in the range of several hundred kilobars, multiple waves are observed which indicate the presence of slope discontinuities, or cusps, in the stress–volume relation.[3] During the time these waves are propagating across the specimen thickness, the specimen is essentially divided into a number of zones separated by the different wave fronts. Thus, the electrical resistance between the electrodes of the specimen is equal to the sum of the resistances of the zones. Assuming time independent wave velocities, stress amplitudes, and resistivities, the initial

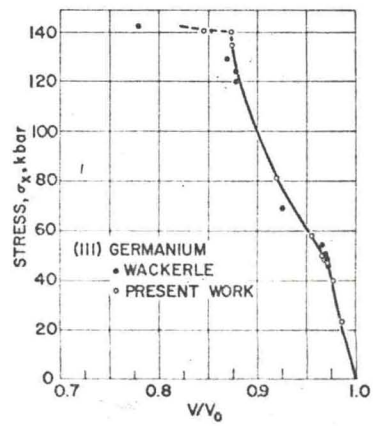

FIG. 1. Stress–volume relation.

and final values of the resistance are connected by a continuous line made up of segments of different slope, each segment corresponding to the propagation of a wavefront through the specimen. The initial and final values of the resistance explicitly define the change in resistivity due to the impact stress; the discontinuities in slope show the existence of multiple waves and define transit times for each wave from which the wave velocities can be calculated. The complications resulting from wave reflections and subsequent interactions, which are inherent in free surface velocity techniques, are avoided.

In order to determine the stress–volume relation, the particle velocity associated with each wave must be known in addition to the wave velocity. Because of symmetry, the total particle velocity imparted to the specimen disk is one-half the experimentally measured impact velocity. In general the division of the total particle velocity between multiple waves is unknown from a single experiment; however, if in a series of experiments the total particle velocity is systematically varied in the immediate neighborhood of a suspected cusp in the stress–volume relation until a change in the number of waves is observed, the particle velocity associated with each of the multiple waves can be established. The stresses and volumes associated with any multiple wave structure can then be calculated from conservation of mass and momentum relationships.[4,5]

The stress–volume values determined in this manner are shown in Fig. 1 and compared to values obtained by Wackerle[6] from a free surface velocity technique. Two cusps were observed and investigated, the first at 44 ± 4 kbar corresponds to the transition between elastic and plastic behavior, and the second at 140 ± 10 kbar is probably related to the phase transition between the diamond and β-tin crystal structures which was first observed by Minomura and Drickamer[7] at a hydrostatic pressure of 120 kbar. The large uncertainties quoted result from limited data in the neighborhoods of the cusps rather than from lack of precision in the measurements.

The authors are indebted to J. Wackerle for allowing them to use his stress–volume data prior to publication.

* Work supported by the U. S. Atomic Energy Commission.

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[5] This assumes that the particle velocity associated with each cusp is independent of impact stress amplitude.

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Erratum: New Oxy–Hydrogen Burner for Flame Fusion

[36, 1784 (1965)]

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THE burner developed at the Laboratory for Insulation Research (Ref. 6 in the paper) was incorrectly identified as a tricone burner. It is however, a three-tube coaxial-type postmix oxy–hydrogen burner. It might also be noted that L. Merker has a process patent describing a three-tube burner (L. Merker, U. S. Patent 2, 764,490-25, September 1956).

Announcements

Second International Biophysics Congress Vienna (Austria) 5–9 September 1966

THIS Congress is being organized by the International Organization for Pure and Applied Biophysics (IOPAB). General sessions of invited papers will be devoted to energy transfer and conversion, to molecular aspects of differentiation and to emerging developments in biophysics. There will also be symposia arranged by the Commissions on: Molecular Biophysics, Cell and Membrane Biophysics, Communication and Control Processes, Radiation and Control Processes, Radiation Biophysics, by the Committee on Education, and by affiliated commissions of IOPAB. Contributed papers on all subjects of biophysics will be accepted. Abstracts of such papers are due by 15 May 1966. Inquiries should be directed as follows:

Scientific Program:
Secretariat: Wien, IX. Alserstrasse 4, Phone: 52-61-87, Wiener Medizinische Akademie, Mrs. E. Weidenhaus.

Housing, Travel Arrangements, and Entertainment Program:
Reisedienst der Wiener Medizinischen Akademie, Wien, IX Alserstrasse 4, Phone: 63-45-13.

Commercial Exhibition:
F. Scherbetz, Wein, IX. Kinderspitalgasse 4, Phone: 42-33-47

Fourth International Conference on Quantum Electronics

The Fourth International Conference on Quantum Electronics will be held in Phoenix, Arizona, on 12–14 April 1966. The conference program will include contributed papers in all areas of quantum electronics, including the basic theory and basic physics of masers and lasers; advances in quantum electronic devices and technology; applications of quantum electronics, especially lasers, and related topics in physics, electronics, and optics. Authoritative papers are particularly sought in emerging laser applications areas to shed light upon the present status and future prospects for significant laser applications in a wide spectrum of scientific and technological fields, including physics, chemistry, biology, medicine, metrology, communications, and others.

Information concerning conference registration and accommodations can be obtained from the Conference Chairman, Dr. J. P. Gordon, Bell Telephone Laboratories, Murray Hill, New Jersey. Abstracts of talks intended for presentation at the conference, in five copies and not over 4000 characters in length, must be submitted not later than January 3, 1966, to the Program Committee Chairman, Professor A. E. Siegman, Microwave Laboratory, Stanford University, Stanford, California 94305. Selected papers from the conference will be published in full after the conference in one or more conference issues of the *Journal of Quantum Electronics*. Final manuscripts for these conference proceedings must be submitted at the conference.