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from the Morse potentials; (2) the contribution from the volume-dependent lattice energy to the formation energy is very large and must be taken into account; (3) the relaxation near the vacancy is highly anisotropic and quite large but such relaxation energy contributes only about 25% of the formation energy.

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FI 3 Effect of Pressure on Equilibrium Vacancy Concentration in Platinum.* ROY M. EMRICK, Univ. of Arizona.--Pressure effects on the relative vacancy concentrations in 0.003 in. dia. reference grade platinum wires have been inferred from resistance increases after quenches in high pressure argon. The quench rate is varied at each pressure (up to a 6kbar maximum) and the resistance increase extrapolated to an infinite quench rate. A formation volume for vacancies in platinum is derived. The results are much more sensitive to impurities than in the cases of gold and aluminum. Previous results indicate that the vacancy loss during quench in platinum is by migration to dislocation sinks. The present results support this conclusion.

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

FI 4 Temperature Dependent Dislocation Contribution to Elastic Constants.* G. L. WIRE, R. O. SCHWENKER+ and A. V. GRANATO, University of Illinois.--It was discovered by Thompson and Holmes[1] that the dislocation contribution to the elastic constants is strongly temperature dependent, increasing by a factor of order five from helium to room temperature in low strain-amplitude measurements on pure copper. They developed a theory for the effect assuming (1) that only the short range part of the pinning potential was important, and (2) that breakaway of the dislocation line would occur when the mean square thermal force exceeded a critical value. We have calculated this effect without these two assumptions and found that the effect is quite small below room temperature unless pinning strengths of at least four times smaller than those supposed (1/10 eV) are assumed. The calculated thermal force is in agreement with that of Thompson and Holmes, but the dislocation displacement obtained is much smaller than that observed.

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[1]D. O. Thompson and D. K. Holmes, J. Appl. Phys. 30, 525 (1959).

FI 5 The Effect of Superconductivity on the Stress Relaxation in Indium.* J.M. GALLIGAN and M. SUENAGA, Brookhaven National Lab.--When lead crystals are plastically deformed at low temperatures, the normal state flow stress is higher than the superconducting state flow stress.[1] Some stress-relaxation measurements of lead crystals[2] have shown that this effect is consistent with an ultrasonic attenuation of a mobile dislocation through an electron-dislocation interaction. We have measured the stress relaxation in indium crystals as a function of temperature, at temperatures below the superconducting critical temperature, and compared these results with possible models of dislocation-electron interaction.[3]
*Work supported by the U.S. Atomic Energy Comm.
[1]H. Kojima and T. Suzuki, Phys. Rev. Letters 21, 290 (1968).
[2]M. Suenaga and J.M. Galligan, Scripta Met. 4, 697 (1970).
[3]G.P. Huffman and N. Louat, Phys. Rev. Letters 24, 1053 (1920).

FI 6 Plastic Deformation of Single Crystals of α-phase Cu-Al Alloys at 4.2°K.* J.S.AHEARN,JR,andJ.W. MITCHELL, Univ. of Va.-- Square sectioned single crystals of Cu-7.5 atomic% Al alloys with [321] axes and {1̄11} and {1̄45} surfaces were deformed in tension at 4.2°K. The critical resolved shear stress was 2.97 ± 0.34 kg mm^{-2}. Etch pit observations by replica electron microscopy show a high density of dislocations within narrow bands of deformation. The mean density was 2.3 x 10^8 cm^{-2}. The dislocations appear as pile-ups of positive and negative dislocations on close-spaced clusters of glide planes. The total number of dislocations associated with a band was determined from the integrated step height measured with the interference microscope. The bands show uniform shear with this microscope and individual slip lines are usually not resolved. High resolution replica electron microscopy shows groups of slip terraces which are more closely spaced than at higher temperatures. Their spacings correspond to the spacings of the glide planes determined from the etch pits. The mean number of dislocations corresponding to the resolved slip terraces was 460.
*Work supported by the U.S. Atomic Energy Commission.

FI 7 Dislocations and Internal Friction in Titanium Carbide.* A. GERK, D. KOHLSTEDT, and WENDELL S. WILLIAMS, U. of Ill.*--As part of a study of dislocation motion in solids exhibiting strong bonding, we have investigated internal friction in titanium carbide at temperatures up to 1000°C. The Marx composite oscillator technique was used, and the specimens were polycrystals of large grain size. The decrement, related here to dislocation motion, increased rapidly at temperatures above approximately 650°C. The corresponding activation energy was 0.75 ± 0.10 eV. The results will be compared with others obtained from compression tests on similar specimens.

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FI 8 Evidence for a New Mechanism for Internal Friction.* H. M. SIMPSON, A. SOSIN, and D. F. JOHNSON, Univ. of Utah--Investigations of the effect of electron irradiation on the damping in high purity copper show that the decrement can increase due to the addition of point defects. The magnitude of the increase is dependent on annealing treatment; annealing at 773°K gave an increase of a factor of two, whereas a 1023°K anneal eliminated the peak. The modulus defect shows no peak-ing effect but has a simple time dependence of $(1 + \alpha t)^{-1}$ for constant defect production rates; the magnitude varies from 4.0% to 0.85% for respective annealing temperatures of 773°K and 1023°K. Irradiations performed on samples which were previously annealed at 1023°K yield an approximately linear dependence between the decrement and the modulus defect. These observations are not consistent with the long-standing Granato-Lucke theory but can be accounted for in terms of dislocations dragging the radiation-induced point defects.

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

FI 9 Vibrating String Model Analysis of Dislocation Damping, Modulus Defect, and Pinning in Copper Crystals. V.K.PARÉ, H.D.GUBERMAN and P.B.DENEE,* Oak Ridge National Laboratory.†--The temperature dependence of dislocation damping and resonant frequency (∿17 kHz) was measured in copper crystals both in the annealed state and immediately following fast neutron irradiation at 20°K. Determination of dislocation density by etch pit counts made it possible to calculate all parameters in the amplitude-independent vibrating string (Koehler/Granato-Lücke) model of dislocation damping. The calculated drag constant was higher than accepted values by a factor of ∿50 and showed little variation with temperature.