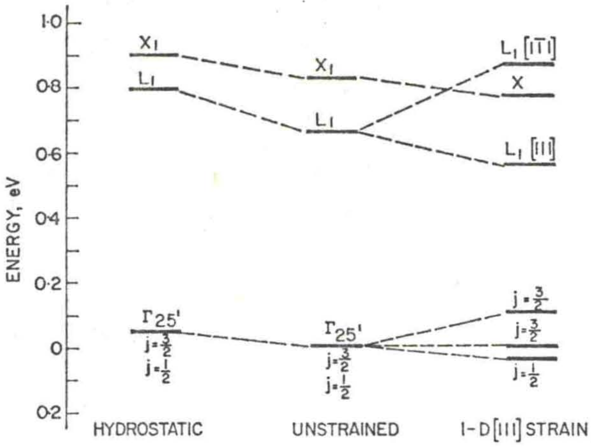

FIG. 6. Diagram of the effect of a 2% hydrostatic compression and a 2% one-dimensional [111] compression on critical points in the band structure. Values shown are calculated from the analysis of GOROFF and KLEINMAN.(3)

band maximum from the calculated energy gap change obtained from our experimental results. This computation suggests that the effective valence band maximum is essentially stationary in energy as if splitting of the valence band edge results in a new distribution of holes among the closely spaced valence band energy levels whose behavior approximates the original unstrained behavior. However, the physical significance of this observation is not clear, since data describing the populations of the various valence band energy levels, hole mobilities and effective masses for Ge in [111] one-dimensional strain are necessary to provide data for a more complete analysis. The large change in the effective mass of holes for Si under uniaxial *stress*(32) suggests that significant changes are to be expected.

The source of the finite time to establish equilibrium resistivity is not apparent from previously measured relaxation times of carriers. Intervalley relaxation times have been measured by high frequency ultrasonic absorption of shear waves(33) and are about 10^{-11} sec at room temperature and for low carrier densities. Similarly, the relaxation time for the repopulation of holes is of the same order of magnitude or shorter. Thus, the observed resistivity relaxation is most likely due to impurity scattering or generation–recombination times.

In summary, the resistivity measurements in elastic one-dimensional strain provide a measure of an effective coefficient of energy gap change with [111] one-dimensional strain if atmospheric pressure values for mobilities and effective masses are assumed for the strained crystal. The coefficient determined gives a shear strain contribution which agrees to 60% with the theoretically predicted value for Si. However, further experiments in one-dimensional strain are required for a more complete physical description of the conduction process. Our results indicate that shock waves in the elastic region provide a convenient deformation for the study of the change in the band gap of Ge by shear strain.

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