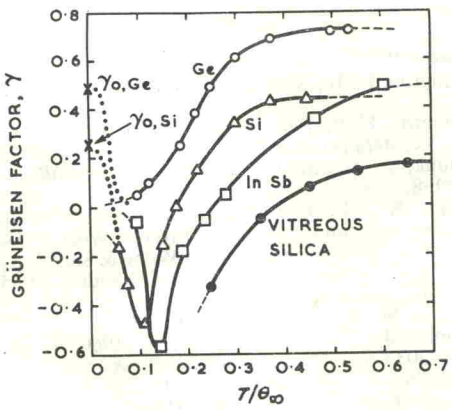

Fig. 9. *Variation of Grüneisen factor with reduced temperature* T/θ_∞ *for germanium* ($\theta_\infty = 400°K$), *silicon* ($\theta_\infty = 495°K$) *and indium antimonide* ($\theta_\infty = 214°K$)

in these materials exhibits behaviour qualitatively like that shown on Fig. 8 for the transverse acoustic mode, i.e. those mode frequencies in the dispersive region which exhibit an anomalous volume-dependence, their frequencies decreasing as the crystal is compressed. This behaviour of γ_{Gr}, quite general in the materials with zinc blende structure,[57] stresses a fundamental limitation of the acoustic method for examining simple anharmonicity revealed by the low-frequency acoustic γ's, namely that experimental restrictions placed by the frequency limit of the measurements, $\sim$ 10 mc, confine the obtainable information to the non-dispersive region. An ideally direct means of circumventing the restriction will be to perform slow-neutron diffraction[58] experiments on crystals in the high-pressure ambient. As yet this is a virgin field for endeavour which may not present impossible difficulties when tried. It is also possible that thermal diffuse scattering of *X*-rays by materials at high pressures may provide information about *changes* of the shape of the vibrational spectrum in those materials where large charges are to be expected. We are trying to estimate changes in thermal diffuse scattering in RbI crystals as the NaCl $\rightarrow$ CsCl structure transformation pressure is approached, in order to verify our hypothesis of large negative γ's for certain TA modes (see section headed Rubidium Iodide). A further *simple* experiment to investigate the volume dependence of the modes, with propagation vector extending to the [100] zone boundary in germanium is also being tested. This experiment seeks to measure directly the pressure shift of the phonon kinks in tunnel diode characteristics at very low temperatures,[59] thus using a simple electrical measurement to give values of γ for these modes, especially to verify the qualitative analysis that the γ's of those transverse acoustic modes will be negative.

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