To the extent that eq. (82) applies, no multiplication occurs in the front of the elastic precursor, so the value of A is of no consequence in determining the precursor decay. A set of decay curves for single crystal tungsten are shown

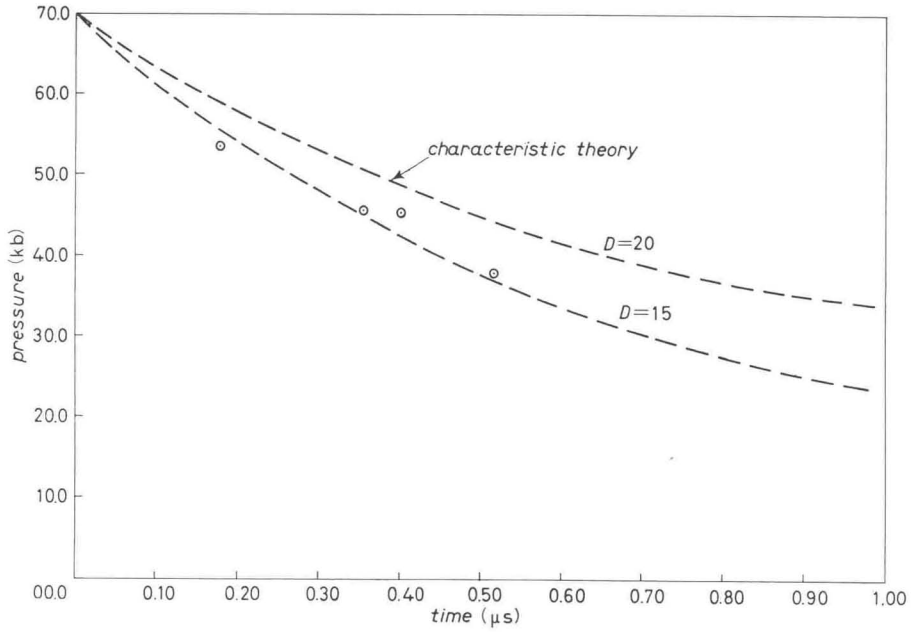

Fig. 20. – Precursor decay in single crystal tungsten, courtesy of T. E. MICHAELS, W.S.U. (unpublished).

in Fig. 20 for different values of the drag coefficient D. Here, as in work reported elsewhere, it is necessary to assume a value of N_{om} much higher than the measured values in order to get reasonable agreement with experiments.

In order to see the effect of dislocation multiplication, one must record the wave profile between the elastic precursor and the plastic shock. Such a profile obtained with a quartz gauge on LiF is shown in Fig. 21. By adjusting the parameter A in eq. (92), the sharp drop in amplitude immediately following the elastic peak can be explained.

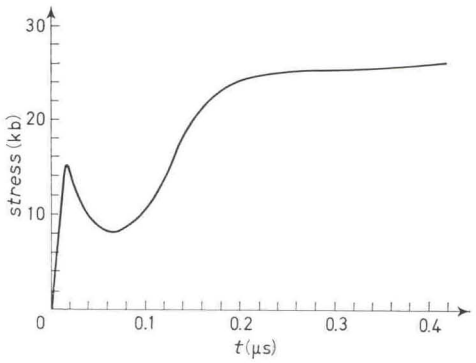

Fig. 21. – Precursor and shock in LiF. (J. ASAY, W.S.U.).

It is not yet clear whether critical tests of dislocation theory can be made from shock profile meas-

urements. There is not yet any clear-cut evidence that dislocations bear any relation to elastic-plastic behavior in shock. It appears, however, that the subject is worth pursuing in depth for at least one case until a definitive answer appears.

7. – Irreversible phase transitions.

Equilibrium phase transitions were discussed in Sect. **5** and a formal procedure for integrating the flow equations through the mixed-phase region was described. The central relations are given in eqs. (61) and (62) together with the equilibrium assumption, eq. (64). When considering the irreversible case we need to re-examine the assumptions made in obtaining eqs. (61) and (62). In a general sense it is possible to have irreversible mass transfer, irreversible heat transfer and irreversible work transfer between the two phases. The first of these occurs if the reaction parameter f is out of equilibrium, the second if temperatures of the two phases are unequal and adiabaticity is violated, the third if pressures in the two phases are out of equilibrium. Of these three it is quite easy to imagine f out of equilibrium; this is in fact probably the usual case since the deviation of f from equilibrium corresponds to a value of the Gibbs energy above the minimum and this acts as a force to drive the reaction toward equilibrium.

If nucleation of the second phase occurs at very many points in every volume element so that dimensions of crystals in either phase are very small, it is unlikely that pressure will be significantly out of equilibrium. Temperature equilibration, however, takes place relatively slowly and in any particular case it may well call for a closer examination. However as an approximation at this stage it looks reasonably good and preferable to the other simple alternative that no heat exchange whatsoever occurs between phases. Equations (54) and (55) represent another possible source of error inasmuch as the interfacial energy between phases is ignored. Here again it seems unlikely that the effect will be large, and it seems appropriate to ignore it for the present. With assumptions unchanged from those previously made, we again arrive at eqs. (61) and (62) with coefficients the same as before. It's important to note that both here and in Sect. **5** it is assumed that both phases have the same particle velocity, u. This is appropriate for solid-solid transitions; it would not be appropriate for gas-liquid or gas-solid transitions.

The difference between the treatment of reversible and irreversible transitions then reduces to the computation of f. In Sect. **5** f was computed from the Clausius-Clapeyron equation (eqs. (64) and (65)). In the irreversible case we assume that

$$\mathrm{d}f = g(V, T, f)\,\mathrm{d}t\,. \tag{93}$$