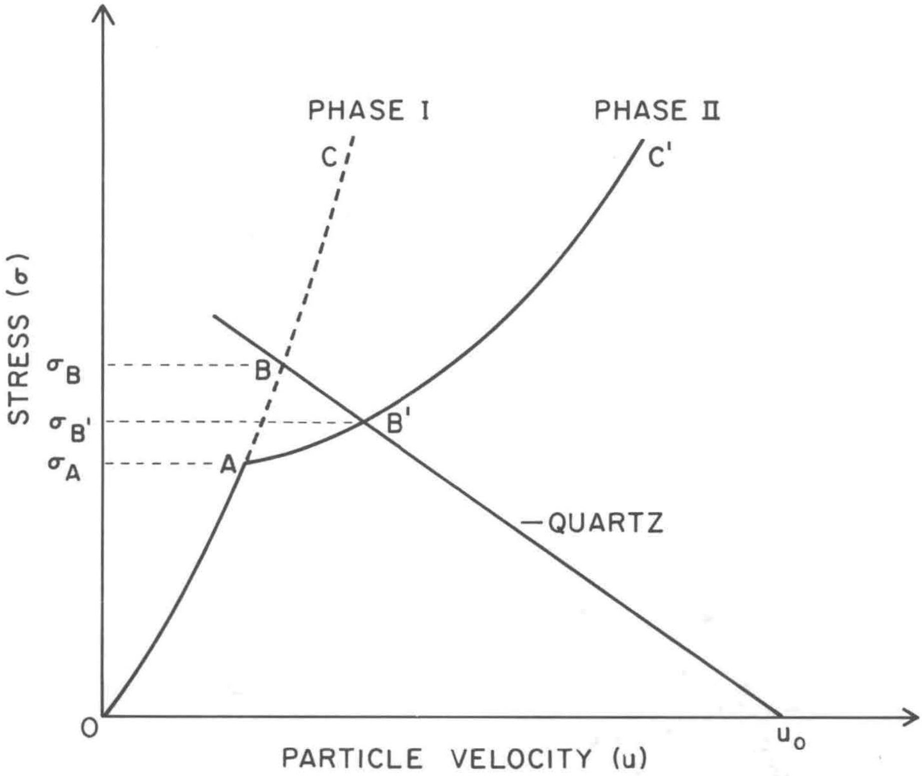
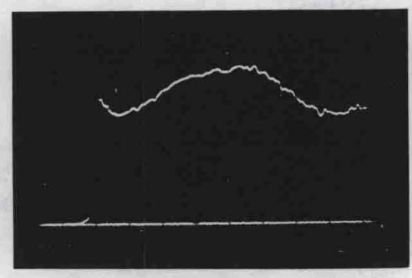


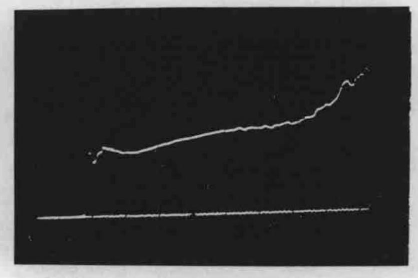
Fig. 3 -- Stress-particle velocity diagram for a material which transforms to a new phase at stress σ_A, being shocked to a stress $\sigma_B > \sigma_A$ by an impactor, moving with a velocity u_0. In the diagram impactor is a quartz gage.

the rise time of the recording instrument the impact stress would relax from σ_B to $\sigma_{B'}$ in some finite time. In no case would it shock up. Thus for a phase-transforming material impact stress cannot shock up as it does in our profile. Hence, the first question that arises is whether the profile represents a material property of BaF_2 or whether the quartz gage is behaving in a peculiar manner, since these shots develop a stress of 40 kbars in the gage, a value which is near or above the upper limit for reliable performance. Three experiments were performed to rule out one of the above mentioned alternatives. In the first of these experiments an aluminum 6061-T6 projectile was impacted on a quartz gage with a sufficient velocity to guarantee an impact stress of 40 kbars. The stress profile obtained was steady and showed no peculiarities whatsoever. In the second experiment, a projectile generated 55 kbars in the gage. At this stress the quartz gage was found to break down. The profile obtained is shown in Fig. 4(a). The third experiment consisted of impacting a specimen of BaF_2 on a quartz gage to generate a stress of 55 kbars once more. The stress profile obtained in this experiment is shown in Fig. 4(b). It may be seen from Figs. 4(a) and 4(b) and the result of the first experiment that, except for distortions due to response time and nonlinearity of the quartz gage response, the total stress profile shown in Fig. 2 does represent the mechanical behavior of BaF_2. The type of profile shown in Fig. 2 continues to be present at impact stress down to $\sim$25 kbars. Below 25 kbars the impact stress profiles are steady, as shown in Fig. 5.

A plot of stress and particle velocity for BaF_2 specimens with <111> orientation (Fig. 6) shows that (1) the values of steady state stress and the corresponding values of particle velocity lie along the stress vs particle velocity curve of BaF_2 <111> in the β-phase,



(a)



(b)

Fig. 4 -- Stress-time profile at 55 kbars. (a) By impacting a quartz gage on aluminum. (b) By impacting a quartz gage on a BaF_2 specimen.

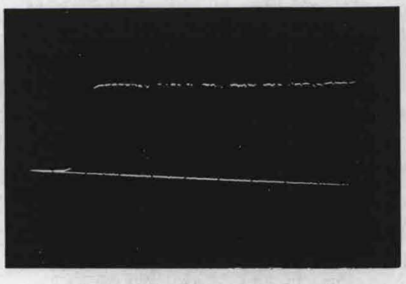


Fig. 5 -- Stress-time profile obtained for shock compression of BaF_2 in <111> direction for an impact stress below 25 kbars.