

constant temperature it can be concluded that, in the  $P$ - $t$  region studied (see Fig. 3), the high-pressure phase, cerium II, has both a higher compressibility and higher thermal expansion than the low-pressure phase.

For example, at 200°C as the pressure is increased from 14 to 17 kb, the reduction in  $d$ -spacing for the high-pressure phase is twice that for the low pressure phase. Even more surprising is the fact that in two independent runs (using diamond internal

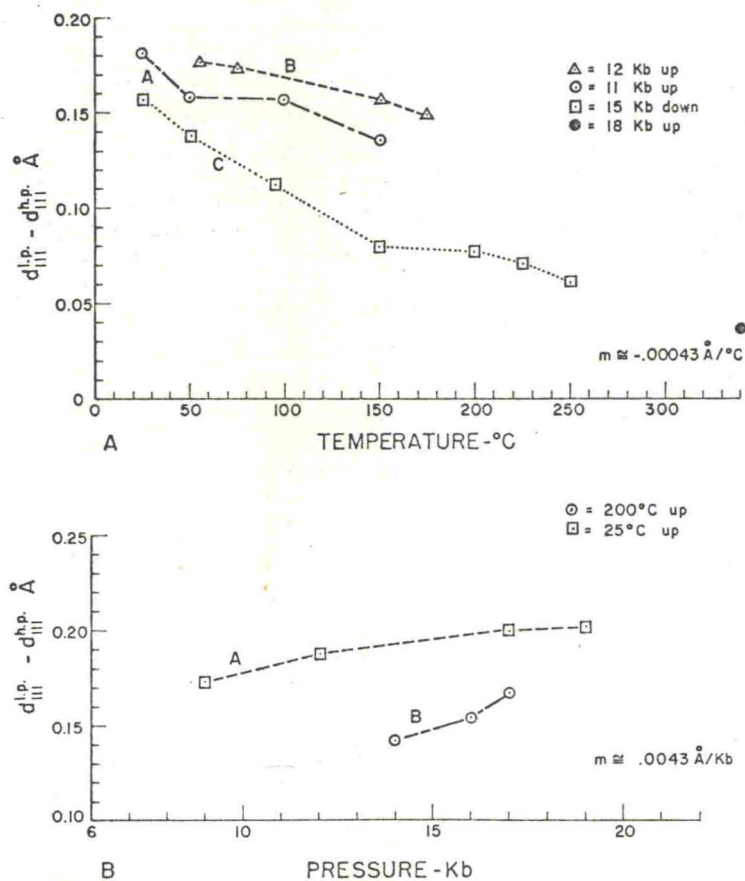


FIG. 4. Spacing differences of the 111 peak of phase I and II of cerium as a function of (a) temperature and (b) pressure. The value for the slope given is the best fit for all the data present.

This phenomenon was observed by noting the relative positions (centers of gravity) of the 111 diffraction peak of each phase. On all runs at constant temperature the two peaks diverged in Bragg angle with increasing pressure, whereas at constant pressure the two peaks converged with increasing temperature. The results are expressed as a variation in  $\Delta d_{111}$  with pressure and temperature in Fig. 4, a and b. It is also apparent that the change in  $\Delta d_{111}$  is almost entirely due to a change in the spacing of the high-pressure phase.

standard) the results indicated a contraction by a very small amount (approximately 0.2 per cent) of the low-pressure phase compared to an expansion of about 1 per cent of the high-pressure phase for an increase of about 125°C at 11 kb. In another run, with an increase of 60° at 14 kb, the change was approximately +0.6 per cent for the high-pressure phase and again -0.2 per cent for the low-pressure phase. Even if one regards the measurement of the small changes for the low-pressure phase to be in error, one cannot escape