TABLE
Variation in lattice parameter of cerium under pressure.

p, kg/cm²	Lattice parameters a, Å	
	γ-phase	α-phase
1	5.158	–
1100	5.152	4.879
1900	5.143	not measured
3300	5.134	4.854
4400	5.133	4.867
5300	5.128	not measured
5900	5.123	4.809
6300	5.117	4.794
7000	5.112	4.782
7600	5.108	4.781
8100	5.107	4.777
8800	5.103	4.776
9900	5.098	4.754

Note. a determined within ± 0.005 Å.

CONCLUSIONS

1. The pressure dependence of the compressibility factor $\left[\varkappa = -\frac{1}{V_0}\left(\frac{\partial V}{\partial p}\right)_T\right]$ for the γ-phase differs according to whether it is derived from equation (1) or (2). According to Bridgman the compressibility factor γ-Ce rises with pressure, but according to our data it is not dependent on it, which means that the value of $\Delta V/V_0$ is a linear function of the pressure. This relation was found by Bridgman [26] in his first work on cerium, where only the compressibility of the γ-phase was measured because the transition to the α-phase was delayed by impurities. A linear relation between the pressure and relative volume change has also been found for the initial phase of cerium in [25].

The difference between our results and those of Bridgman [1-3] may be due to the fact that the piston displacement method which he used only measured the total volume change of the specimen due to the compressibility of the different phases of cerium and the changes in volume accompanying the phase transitions. Analysis of high-pressure diffraction patterns showed a γ-phase to exist in cerium at 10,000 kg/cm². The same was found in [13, 16, 21].

It is evident from Fig. 4 and equations (2) and (3) that the α-phase has higher compressibility than the γ. These conclusions are in contradiction with Bridgman's data [1-3] but are consistent with the results of [16, 21, 25].

2. It must be said that the β-phase detected in cerium in our experiments under pressure is probably the result of the experimental conditions, the rise and high level of hydrostatic pressure in the apparatus (Fig. 3). The hexagonal phase of high-pressure cerium was first discovered in the work by Lawson and Tang [19]. They said this phase appeared below the pressure of the γ-α transition but sometimes continued to exist at higher pressures. Those authors give neither lattice parameters nor indices of the diffraction lines in their work, and remark that the reproducerability of the phases was poor. The authors of [19, 20] apparently had a lower level of hydrostatic pressure in their apparatus, so that plastic deformation could occur in the cerium specimen, partially or completely suppressing the appearance of the