

temperature, even at low stresses, in the case of creep in liquid nitrogen and stress of 0.6 kg/mm² and above, the departure from this regularity seems to be due to the formation of a single-phase structure as a result of the polymorphous transition.

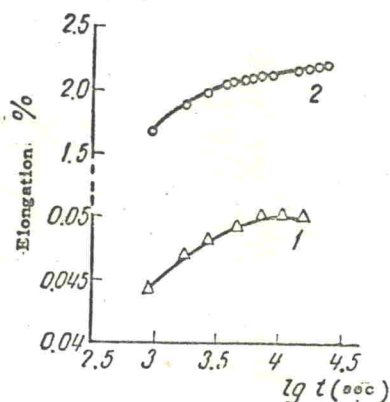


FIG. 5. Creep curves of lithium at 77°K after prior 35 per cent deformation in liquid N₂.

1 - $\sigma_0 = 0.3$ 2 - $\sigma_0 = 1.5$

2. *Creep of lithium specimens after prior deformation at 77°K.* Fig. 5 shows the creep curves of lithium specimens at 77°K after prior deformation by 35 per cent in liquid nitrogen.

The prior deformation causes a partial b.c.c.-to-f.c.c. transition, and the movement of dislocations during creep takes place from the very beginning in a complex two-phase system. This explains the low value of deformation at the initial stage of creep as compared with the same section on the original specimen tested in creep at the same level of initial stress, 1.5 kg/mm².

Like the specimens of lithium with a complex multi-phase structure formed in the process of low-temperature creep under stresses about the yield point, specimens which have undergone prior deformation at 77°K and have a b.c.c. + f.c.c. structure, exhibit creep which does not follow the logarithmic law. In both cases the prior strengthening treatment causes a more sudden drop in creep at the unsteady stage.

One can imagine the creep curve $\varepsilon(\lg t)$, as consisting of separate parts parallel to separate beams $\varepsilon(\lg t)$, obtained at low stresses. Then the degree of strengthening due to the two-phase state of the system can be assessed from the fact that the final section of the curve at 0.6 kg/mm² has the same angle of slope as the beam obtained at $\sigma_0 = 0.1$ kg/mm² (Fig. 3).

Studies of creep under low stresses, on specimens which have undergone prior deformation, suggest that the infringement of the usual form of dependence $\varepsilon(\lg t)$ is not connected with the magnitude of the stress, but is due to the complexity of the phase composition in the system studied.

3. *Steady-state stage of low-temperature creep.* In earlier investigations [1, 3] the creep tests were usually limited to certain periods of time (of the order of several tens of minutes) embracing the instantaneous jump in deformation and transitory stage of creep. Sometimes the creep curves (at low σ_0) had sections where there was a withdrawal to the horizontal branch ($\dot{\varepsilon} = 0$).

In contrast to those works, our studies of creep in lithium at low temperatures were carried out in a wide range of stresses and testing times (up to 50 hr). At low stresses the creep curves at 77°K (see Fig. 1) show a transition from the unsteady state of flow to practically complete decay of the creep. On the curves