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# LOW-TEMPERATURE CREEP OF LITHIUM IN THE POLYMORPHOUS TRANSFORMATION RANGE*

I. A. GINDIN, V. M. GODZHAYEV, M. B. LAZAREVA and YA. D. STARODUBOV

Physico-technical Institute, Academy of Sciences, U.S.S.R.

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Creep of lithium has been studied at temperatures of 300, 180 and 77°K, which embraced the polymorphous transformation range, and the electrical resistivity of the specimens has been measured in the process of creep. It was found that at 77°K the logarithmic law of the transitory stage of creep is satisfied right up to those stress values at which there is either no polymorphous transformation, or only a slight one. Even for slight stresses, the creep curves of single-phase specimens at 300°K do not follow the logarithmic law. During creep at 77°K it has been found that there is a resistivity maximum for the original specimens, with a monotonic drop on those which have undergone prior deformation at 77°K.

A number of works have dealt with low-temperature creep [1-5]. These works cover creep in mono- and polycrystalline metal specimens with a stable crystalline structure right up to helium temperature. On the basis of experiments Mott in [6-8] has put forward a dislocation theory of low-temperature creep and has given a logarithmic substantiation of the time dependence of deformation.

In the present work it was found that alkaline metals such as lithium and sodium undergo a polymorphous transition with martensitic kinetics under conditions of low-temperature static deformation [9-12]. On extension in liquid nitrogen, for instance, the b.c.c. lattice of lithium is partially transformed to an f.c.c. one. Typically, in the process of deformation the specimen goes over from the single-phase to a "two-phase" state with a continuously altering quantitative phase ratio. It is therefore interesting to study the creep of lithium in the temperature range of this polymorphous b.c.c.-to-f.c.c. transformation on deformation. The present work was an investigation of the nature of the creep of lithium at 300, 180 and 77°K, temperatures which cover the polymorphous transformation range.

## MATERIALS, SPECIMENS AND PROCEDURE

The object of the investigation was polycrystalline lithium 99.3 per cent pure. Specimens for the creep tests were made by extrusion through an aperture 3 mm dia. at room temperature. Spherical heads like the inserts of chucks [13] were riveted on the ends of the cylindrical specimens (the test length of which was 100mm ).

To avoid oxidation all the operations of preparation were carried out in kerosene. To remove the resultant cold work we used a long anneal in kerosene at room temperature. The oxide film was removed by etching in methyl alcohol.

The low-temperature creep was brought about at a constant load on the apparatus described in [13]. The deformation was measured by means of an optical pick-up with a photographic recording of the "elongation-time" graph. The creep tests were performed at 300, 180 and 77°K. The creep curve was determined as

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