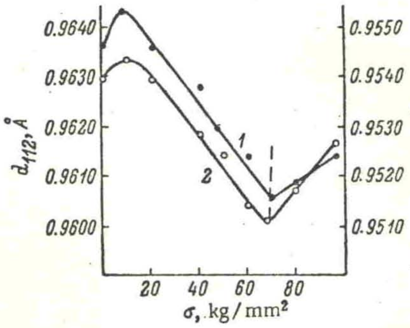

Fig. 2. The change in interplanar spacings d_{112} (1) and d_{201} (1) in polycrystalline beryllium as a function of stress under slow loading.

during the x-ray exposure. The continuous curve corresponds to calculation of d under the assumption of constancy of specimen cross section. The course of the curves $d_{201}(\sigma)$ and $d_{112}(\sigma)$ for the case of loading according to scheme II is in principle similar to that considered above (Fig. 2). It is seen, however, that the first region has contracted to 0-8 kg/mm^2 and in the creep region the increase in d is less than it was for the case of rapid loading.

From the data obtained, it follows that the interplanar spacings in the beryllium crystal lattice depend on the applied load in a complex, nonmonotonic manner.

For the case of elastic deformation the interplanar spacings must decrease linearly under compression. Practically, an increase in d_{201} and d_{112} occurs in the first and last stages of deformation. Changes in the crystal lattice dimensions not connected with elastic deformation can result from the following effects: 1. The specimen is in a state of quasihydrostatic compression similar to a closed high-pressure vessel; 2. Stacking faults arise during deformation which affect the values of the interplanar spacings in different ways; 3. Variation in interplanar spacings is related to the process of plastic flow, i.e., to the multiplication of dislocations, their movement and interactions.

Taking into account that plastic deformation can occur in separate grains in beryllium at relatively low stresses (the critical shear stresses for basal glide are about 1 kg/mm^2), we feel that the nonmonotonic stress dependence of the interplanar spacings bears in the main a dislocation character. The effect of dislocations on volume (and, as a consequence on the interplanar spacings) has been analyzed theoretically in [3]. It is possible that the increase in d during the initial stage of deformation is related to the process of dislocation multiplication. In this case the contribution of plastic deformation to the overall deformation of the lattice must depend on the fraction of grains in which the process of plastic flow has already begun. Upon increasing the length of time during which the specimen is held under load (loading according to scheme II) the fraction of such grains is increased, which leads to the shift in the maximum on the d(σ) curves to the left (Figs. 1 and 2).

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