3rd INTERNATIONAL SYMPOSIUM

High Purity Materials in Science and Technology

DRESDEN,
GDR,
May 5-9, 1980

Poster-Abstracts

DISLOCATION INTERNAL FRICTION IN HIGH-PURITY ANTIMONY CRYSTALS

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To derive characteristics of the basic dislocation - pinning centre interaction in Sb crystals, the amplitude dependence of internal friction and modulus defect was studied at the frequency 88 kHz. As temperature lowered from 300 K to about 40 K, the curves monotonically shifted towards greater amplitudes, which is due to the thermally activated breakaway of dislocations from pinning centres. In the vicinity of helium temperatures an anomalous behaviour of the amplitude dependences was observed. The dependences onset was practically temperature-independent, but because of a sharp increase in the decrement and modulus defect with the amplitude growth, the curves shifted towards smaller amplitudes as temperature lowered.

The results obtained for range 40 – 300 K were compared with Eshelbon-Chernov's theoretical predictions. The agreement was good to permit a treatment of the experimental results in terms of the above theory. The dependence of activation parameters describing the process of dislocation overcoming of the pinning centre upon the external stress amplitude was obtained. Extrapolation of the activation energy to the zero stress amplitude yielded the dislocation - pinning centre binding energy, which appeared to be 0.5 eV. The dependence of activation volume on stress amplitude was used to restore the force law of the dislocation - pinning centre interaction. The function of length distribution segments was found and shown to be a power law with the exponent -5.6 .

The specific features of the low temperature dynamic behaviour of dislocations, which are responsible for the anomalous amplitude dependence shifts in the temperature regime below 40 K, are discussed.