OUR PRESENT UNDERSTANDING OF
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OUR PRESENT UNDERSTANDING OF DISLOCATION DAMPING

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For ultra-purity copper the dislocation mobility has been investigated by measuring damping and modulus defect in the MHz- and kHz-range, in order to test the validity of the dislocation resonance theory. Electron irradiations have been applied in order to vary the pinning point density. In both frequency ranges initial difficulties occurred. In the MHz-range at low frequencies, too high values were found for the damping, in contrast to the modulus. It could be shown that these were due to a set of long loop dislocations. In the kHz-range the pinning point number obtained by damping turned out to be smaller than that obtained by modulus change. This discrepancy could quantitatively be understood by taking into account deviations from the statistical loop length distribution due to vibrational entropy of the dislocations and clustering of the point defects.

The removal of these two difficulties led to a good agreement between the data of the two frequency ranges with respect to the pinning behavior. Concerning the temperature dependence, AL was found to have the same values in both ranges which strongly increased with temperature. Concerning the drag constant B, however, a strong disagreement in both frequency ranges was obtained (A and L are density and loop length of the dislocations). While in the MHz-range the drag constant B increased approximately linearly with temperature, it stayed constant in the range between 40 and 350 K in the kHz-range. This shows that two different dislocation drag mechanisms are acting in this frequency range. The reasons for this behavior are not yet completely clarified.