zone considerably. This is probably the cause of the long flareup time of deformation luminescence at small σ.

At the same time, it follows from the analysis of the possible micromechanism of electron release by dislocations from F centers [4] that, at all values of the mechanical stress, the most probable is capture of an F electron in the dislocation zone. Therefore, the peak II, which arises at large mechanical stresses, meaning also at large dislocation velocities, is apparently connected with the supply of electrons to the moving dislocations from the glow centers.

Thus, the F electron captured in the dislocation zone can move along the dislocation, and also move through the crystal together with the dislocation.

If the dislocation velocity V_d is lower than the effective velocity of the electron along the dislocation V_e, then the luminescence kinetics is determined by the first process. This situation apparently is realized at low stresses (Fig. 1a). Indeed, as seen from Fig. 1, the glow intensity continues to increase after the crystal load is removed (peak I), when the dislocations no longer move.

When the stress is increased, the velocity of the dislocation increases. When the condition $V_d > V_e$ is satisfied, the second micromechanism becomes dominant, and the supply of electrons to the glow centers is determined mainly by the transport of electrons by the moving dislocations (peak II).

If the foregoing assumptions are correct, then the parameters of the dislocation zone can be determined in principle from the analysis of the waveform of the luminescence pulse.

In conclusion, the authors consider it their pleasant duty to thank V.L. Broude, V.Ya. Kravchenko, and V.L. Pokrovskii for fruitful discussions and valuable advice.

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SUPERCONDUCTIVITY OF COLD-DEPOSITED FILMS OF ALLOYS OF GERMANIUM WITH NOBLE METALS

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In [1] we reported that films of the system Au-Ge, evaporated by a laser pulse on a cold substrate, are superconducting and have a transition temperature 2.7°K. It was of interest to verify the possibility of formation of analogous metastable modifications in alloys of germanium with other noble metals. In this paper we describe an investigation of the superconductivity of cold-deposited films of the alloys Ag-Ge and Cu-Ge.

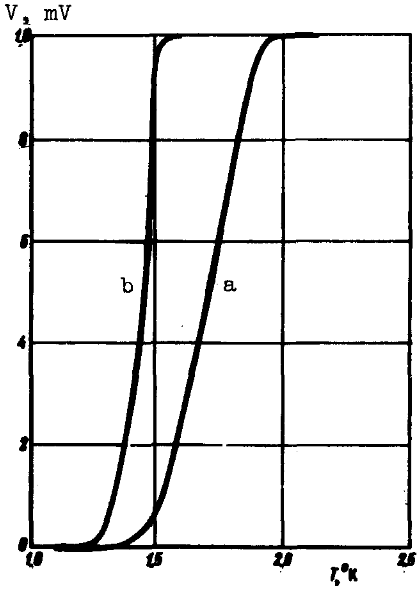

Fig 1

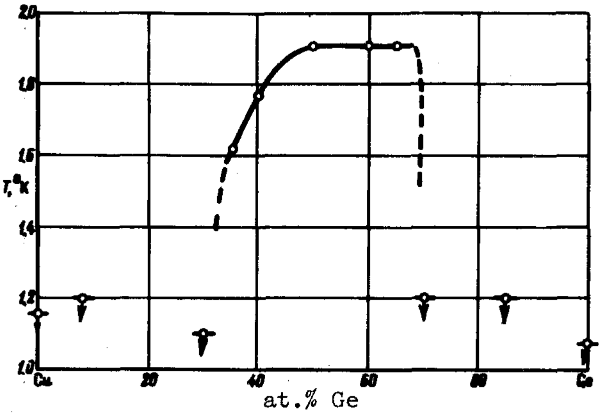

Fig. 2

Fig. 1. Superconducting transitions of cold-deposited Cu-Ge film containing 60 at.% Ge (curve a) and of a cold-deposited Ag-Ge film with 50 at.% Ge (curve b).

Fig. 2. Dependence of the transition temperature of Cu-Ge films on the Ge concentration. The points with arrows indicate the temperature up to which no superconductivity was observed.

The preparation of the alloy films and the measurement of their critical temperature were carried out in accordance with the procedure described in [1]. We first prepared batches of alloys of different concentrations for the Cu-Ge system, and also an Ag-Ge alloy containing 50 at.% Ge. The initial components were melted in a high-frequency furnace in a helium atmosphere. None of the prepared batches became superconducting down to 1.5°K.

The films were evaporated in a special helium cryostat. A laser beam was focused on the batch of the alloy through transparent walls in the lower part of the cryostat, see [1]. To obtain a film of medium thickness, it was necessary to apply from one to three laser "shots." The films were condensed on a mica substrate in thermal contact with the liquid helium.

The Cu-Ge alloy films condensed in this manner started to become superconducting at 1.9°K, and the Ag-Ge films at 1.5°K. By way of an example, Fig. 1 shows transition curves for the Cu-Ge film containing 60 at.% Ge (curve a) and for an Ag-Ge film with 50 at.% Ge (curve b).

The dependence of the transition temperature on the germanium concentration for the Cu-Ge system is shown in Fig. 2. The abscissas represent the raw-material composition of the alloy used to evaporate the film. It is seen from this figure that the superconductivity is observed in the concentration region from 30 to 70 at.% Ge¹⁾. Outside this region, the films did not become superconducting down to 1.1 - 1.2°K.

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¹⁾It should be noted that the shape of the obtained curve is greatly similar to the plot of T_c vs. the Ge content, given by the authors of [2] for quenched bulky Au-Ge samples.

When all the superconducting cold-deposited Cu-Ge films were heated to room temperature, they did not become superconducting after cooling to 1.2°K; the same applied to Ag-Ge down to 1.0°K.

Thus, it can be stated that superconductivity was observed in the systems Au-Ge, Ag-Ge, and Cu-Ge at temperatures from 1.5 to 2.7°K. The onset of the superconductivity can apparently be attributed to the formation of new unstable phases in these systems, owing to the exceedingly large rate of condensation upon evaporation of the alloy by the laser pulse. As already noted earlier [3], the occurrence of superconductivity of nonequilibrium phases, observed in a number of systems, may be due to the fact that these phases have a stronger electron-phonon interaction than equilibrium alloys of the same concentration. It is possible that this is precisely why these phases are unstable.

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GIANT ZERO-BIAS ANOMALIES AND SPACE-CHARGE-LIMITED CURRENTS IN TUNNEL JUNCTIONS

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There exists a special type of zero-bias anomaly of tunnel characteristics, called "giant zero-bias anomalies" and first observed by Rowell and Shen in Cr-I-Ag and Cr-I-Pb tunnel junctions [1, 2]. A giant zero-bias anomaly is a burst of differential resistance of the contact, dV/dI, at V = 0, symmetrical with respect to the ordinate axis and independent of the magnetic field, and corresponding to an approximate tenfold or larger increase of the conductivity dI/dV in the voltage interval from zero to several dozen or even hundreds of millivolts. Attempts to explain the origin of the giant zero-bias anomalies as being due to strong interaction of the tunneling electrons with the antiferromagnetic (or ferromagnetic) barrier [4, 5] are unsatisfactory, mainly because they cannot cover from a unified point of view the entire variety of the phenomena observed in the experiments [1 - 3]. In the present paper we propose an explanation of the giant zero-bias anomalies on the basis of space-charge-limited conduction currents (SCLC) through the dielectric. Such currents can flow in tunnel junctions together with the ordinary tunnel current. We present also preliminary experimental results of an investigation of giant zero-bias anomalies in Sn-I-Sn contacts, where the dielectric layer was produced as a rule by oxidizing the Sn base film in air at room temperature. By varying the film-condensation and oxidation regimes it was possible to obtain both contacts exhibiting standard tunnel characteristics in a wide interval of voltages (0 - 500 mV) and the anomalous characteristics described below.

Figure 1 shows typical current-voltage characteristics of an Sn-I-Sn tunnel contact, exhibiting an anomalous increase of the conductivity in the voltage interval 0 - 250 mV. In the insert is shown the current-voltage characteristic in the region $V \sim 2\Delta/e = 1.21$ mV, demonstrating convincingly that at those voltages the current is determined by the tunnel mechanism. It is important to emphasize that at large voltages, dI/dV is proportional to V in a wide interval, i.e.,