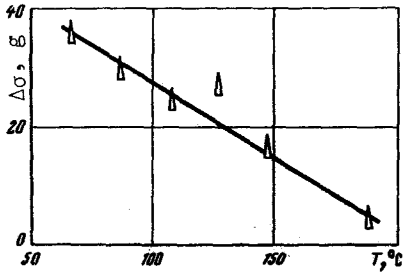

Fig. 2. Temperature dependence of the effect for Ag-ZnSe-Ag

systems Ag-ZnSe-In (approximately 100%) and Cu_2Se-ZnSe-In (approximately 60 - 70%) with the negative potential on the In. A minimum strengthening effect, of several per cent, was observed for In-ZnSe-In. The most reproducible results were obtained for Ag-ZnSe-Ag plates with silver-paste contacts. The main measurements were therefore made for such samples, although the effect was not very large for them. Figure 2 shows the temperature dependence of the effect. The field-induced strengthening decreases with increasing temperature T and vanished at $T \approx 200°C$, which is 80 - 100° lower than the temperature at which the photoplastic effect is quenched in ZnSe. For all samples there existed a threshold voltage below which the effect was not observed. The threshold and its growth differed somewhat from sample to sample. No increase of the mechanical stresses was observed in the elastic-deformation region following application of ~ 2 kV. At the voltages producing the effect, the currents through the samples ranged from 10^{-7} A (For the Ag-ZnSe-Ag systems) to 5×10^{-5} A (for In-ZnSe-In systems). The smallest resistances were those of the In contacts, but we nevertheless could not make them fully ohmic. The effect was observed also in alternating fields at frequencies ≤ 10 kHz, but was much weaker. For example, at 3.7 kHz it was one-tenth the effect in a constant field. In some samples, a jumplike decrease of the mechanical stresses, independent of the polarity of the voltage and weakly dependent on its value, was observed in both the elastic and the plastic region of deformation. This jumplike loss of strength vanished after several successive applications of the field. It can be assumed that it is connected with collective ejections of dislocations to the sample surface from the near-surface layers at the instant when the field is turned on. In electric fields that excite the effect, the resultant strengthening greatly exceeds the values of such jumplike losses of strength. We did not succeed in observing visible electroluminescence in the investigated samples. The lack of strengthening in the elastic region, the existence of a threshold voltage, and its independence of the polarity for symmetric systems (e.g., Ag-ZnSe-Ag), allow us to exclude from consideration such phenomena as thermal heating and piezoelectricity.

A possible mechanism of the observed phenomenon is the change of the state of the crystal electron subsystem by injection of minority carriers from the contact into the volume, accumulation of majority carriers, etc., or by ionization of point centers in strong electric fields. Experiments aimed at explaining the mechanism of the effect are now in progress.

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PHOTODISSOCIATION OF IODINE MOLECULES BY POWERFUL 5310-Å RADIATION. DETERMINATION OF RECOMBINATION RATE OF IODINE ATOMS IN THE PRESENCE OF INERT GASES

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There have been many investigations of atomic iodine recombination reactions $I + I + M \xrightarrow{C} I_2 + M$ [1]. In most cases, when recombination was investigated at relatively low temperatures, the initial concentration of the iodine atoms was produced by flash photolysis. The time variation of the molecular-iodine concentration was determined from the change in the signal of probing radiation in the range $\lambda = 460 - 566$ nm. A similar procedure, owing to the relatively long duration of the light from flash lamps, does not make it possible to observe without disturbance the signal of the probing radiation during the initial stage of the recombination process. In the present study we obtained the initial iodine-atom concentration by using a high-power radiation pulse at $\lambda = 5310$ Å, of energy 1.5 - 2 kJ and duration 50 nsec. When such a pulse passes along a cell containing saturated iodine vapor at room temperature, 80 - 100% of the I_2 molecules dissociated in our case. The 5310-Å radiation falls in the discrete region of the I_2 spectrum, corresponding to a transition of the molecule to the excited state $B^3\Pi_{0u}$. According to the latest data [2], this region is overlapped by the continuous absorption region that transfers the molecules to the repulsion state $^1\Pi_u$. The high degree of dissociation may in this case be due to the fact that the transition in the continuous absorption region, unlike in the discrete one, does not saturate at any attainable radiation densities. Thus, such a procedure for iodine dissociation results in a high degree of decomposition within a negligibly short time (50 nsec) compared with the characteristic recombination times. To verify the applicability of the method, we determined the recombination constants of iodine atoms in the presence of 551 Torr He and 200 Torr Xe. The concentration was determined using the iodine extinction coefficient for $\lambda = 495$ nm, which equals 495 ± 60 l/mol-cm and was determined by us experimentally. The appreciable change of the degree of decomposition on the processed sections of the oscillograms (75 - 30%) (see the Figure) makes it necessary to take into account the change in the rate of recombination of iodine atoms into molecular iodine, due to the change of the I_2 concentration. The recombination rate constant K_m was determined from the differential recombination equation

Typical oscillogram of probing signal (15.9×10^{18} cm^{-3} He + 0.866×10^{-16} cm^{-3} I_2); u_0 - probing-radiation signal corresponding to the absence of iodine.

$$\frac{d[I]}{dt} = -[I]^2(K_{I_2}[I_2] + K_m[m]),$$

where $d[I_2]/dt$ was determined graphically for different values of t, $[I_2]$ is the I_2 concentration for the corresponding t, K_{I_2} is the rate of recombination1) into I_2. We used the value $K_{I_2} = 2.35\times10^{-30}$ cm^{6}sec^{-1} given in [3].

The correction for the expansion of the probed gas column, due both to the heat released upon recombination and to heat released by dissociation does not change the determined constants noticeably at the pressures chosen by us. The obtained values of the recombination rate constants, $(1.6 \pm 0.25)\times10^{-32}$ cm^{6}sec^{-1} for Xe and $(3.35 \pm 0.5)\times10^{-33}$ cm^{6}sec^{-1} for He agree well with the results given in [3]. We believe that the proposed method of iodine molecule dissociation can be used to study those recombination features that are most strongly manifest at high degrees of decomposition [3, 4].

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DEPENDENCE OF FAST-ION NEUTRALIZATION ON THE EMISSION ANGLE IN SCATTERING BY A METAL SURFACE

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It is customary at present to consider ion neutralization on a metal surface by using a model in which the target surface is assumed to be ideally homogeneous and smooth, its electronic properties are described in accord with Sommerfeld-Fermi, and the neutralization is

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1)The recombination rate constant is defined by us as the number of recombination acts per unit volume per unit time for unit reagent concentration.