trode and the surface of the electret), then, in the absence of corona discharge from the conducting wires and from the electrodes, there are obtained insignificant charges (exhibit of $ZnTiO_3$) which drop to zero very quickly. An analogous situation is also obtained by the polarizations in a silicon organic liquid.

The work on the study of properties of electrets from inorganic delectrics is continuing at the present time.

The following persons participate in this work: junior scientific assistant V. S. Mitronina, senior laboratory techncian A. N. Kalganova and also, in the early phase of this work, P. Ch. Muchamedieva.

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*It should be noted that the absolute values of σ on the opposite sides of the electret are nearly equal.

**On the surface of dielectrics of high specific resistance (for example on quartz) there frequently appear, as a result of working the material, friction, etc., surface charges. However, these charges, as a rule, are of relatively small magnitude and are of the same sign at the two ends. Therefore, the error introduced by these changes into the measurements is small.

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Dependence of Dielectric Strength of Alkali Halide Crystals on Temperature

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IT has been considered until not so long ago that the dielectric strength at puncture does not depend on temperature. Investigations of recent years[2–6] have shown that the dielectric strength of alkali halides in the region of puncture does not remain constant, and, as reported in all cited references, the temperature dependence of the dielectric strength at constant intensity exhibits a maximum. The results of these investigations do not agree, however, so far as the puncture values for pulsed voltages are concerned. There is also no agreement in the values of the temperature maximum.

In order to refine the existing experimental data, we have investigated the temperature dependence of dielectric strength for puncture KBr and KCl in the temperature interval from –170° to +200° C. Investigations were conducted at constant voltage and with pulses of 10^{-2}, 10^{-4} and 10^{-6} sec duration with the voltage increasing linearly. For constant voltages and 10^{-2} sec pulses, measurements of the voltage applied to the sample were made with an electrostatic voltmeter whose error does not exceed 5%. The cathode ray oscillograph KO–20 was used for recording of the 10^{-4} and 10^{-6} sec pulse amplitudes with the sample voltage applied to the plates of the oscilloscope through a divider. The measurement error in this case did not exceed 10%.

Samples for crystals were prepared from monocrystals KBr and KCl grown by the method of Kiropulos . A cavity was bored in the crystal plates after which, in order to remove mechanical strains, the samples were subjected to a temperature 50 to 70° below the melting point and then to slow cooling at a rate of 1° per minute. After annealing the thickness of the sample in the region of the cavity was reduced, by polishing of the plane surface, to from 0.1 to 0.2 mm and silver electrodes were formed on the surface of the cavity and on the plane surface by evaporation in a vacuum. To guard against cracking the rate of heating and cooling before puncture was made not to exceed 1° per minute.

Figure 1 shows the temperature dependence for KBr. Each point on the curve corresponds to the mean value of dielectric strength based on measurements of 12 to 20 samples. The mean square error did not exceed 8% for constant voltages and 12% for pulses. As shown in Fig. 1, the temperature dependence of the dielectric strength E_{st} at constant voltage exhibits a maximum at 50° C which is smoothed out with decrease of the voltage duration. For pulses of 10^{-6} sec duration there is no maximum, and a gradual increase of the dielectric strength with temperature is observed. In the region below 50° C, the dielectric strength does not depend on temperature for constant voltages and pulses of 10^{-2} and 10^{-4} sec. Figure 2 shows the results of E_{st} temperature dependence measurements for KCl.

The following conclusions can be made on the basis of the present work.

1. It is established that the temperature depen-

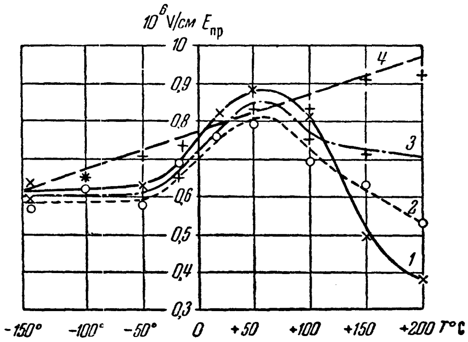

FIG. 1. Temperature dependence of E_{st} for Kbr for various durations of applied voltage: *1*—for constant voltage; *2*—for pulses of 10^2 sec. duration; *3*—for pulses 10^4 sec. durations; *4*—for pulses 10^6 sec. duration

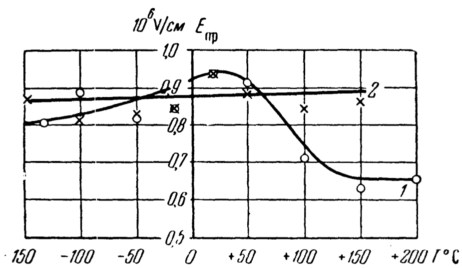

FIG. 2. Temperature dependence of E_{st} for KBr: *1*—for constant voltage, *2*—for pulses of 10^6 sec. duration.

dence of the dielectric strength E_{st} for alkali halide crystals of dielectric voltage exhibits a maximum which is smoothed out as the duration of voltage application is decreased. According to the present theories of electric puncture, which connect the electric breakdown with impact ionization by electrons, there should be observed a gradual growth at constant strength with temperature in the entire temperature range, independent of the duration of voltage application (at any rate for 10^{-6} sec pulses). In Fröhlich's "high temperature" puncture theory,[7] , an effort is made to explain the existence of a maximum in the temperature dependence of E_{st} ; however, it is impossible to explain from the point of view of this theory the fact, that the definitely exhibited maximum at constant voltage is completely absent for pulses of 10^{-6} sec duration.

2. The obtained temperature dependence indicates that the appearance of the maximum is connected with long duration processes taking place in the dielectric upon application of the field. The theory applicable to the explanation of the obtained results is that of Hipple[4] according to which reduction in puncture strength is caused by distortion of the field at the expense of volume charges: at low temperatures negative (electron) charges due to coldpossible emission, and at high temperature positive (ionic) changes due to crystal conductivity. It is cathode that at a certain temperature, both charges so compensate each other that the field is relatively undistorted and puncture strength reaches a maximum. Increase of dielectric strength with decrease of applied voltage duration at high temperatures indicates that the time required for the formation of the ionic charge is greater than 10^{-6} sec.

3. The magnitude of the electron volume change apparently depends on the emission velocity of the electrons from thecathode and, therefore, indirectly on the cathode material and condition of the contact surface as well as on the concentration of the electron traps in the crystal, i.e., on the degree of crystal contamination, preliminary heat treatment, etc.

Since it is very difficult to set up identical experimental conditions, it is quite natural to expect differences in the data obtained by different investigators (especially shift of the maximum).

Final conclusions pertaining to the causes of temperature dependence of E_{st} at puncture, it seems to us, can be made by studying the nature of the currents in the prepuncture field region.

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Elastic Small Angle Scattering of Neutrons by Heavy Nuclei

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RECENT investigations of the scattering of fast electrons on hydrogen[1] substantiate the con-