stabilities is still to be explained.

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LUMINESCENCE INDUCED BY ALPHA PARTICLES IN LIQUID XENON IN AN ELECTRIC FIELD

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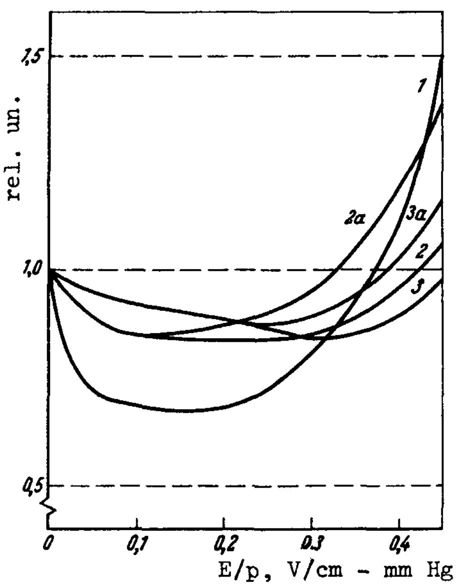
Study of the luminescence induced by the passage of an ionizing particle through a liquefied noble gas in an electric field is of interest, first, to ascertain the behavior of the free electrons in the liquid, and second, to assess the possibility of registering the trajectories of ionizing particles in a liquiefied noble gas by the method used in technique of gas-filled spark track detectors.

The experimental setup has made it possible to register the luminescence of liquid xenon with the aid of a photomultiplier, in electric fields $E \leq 150$ kV/cm. The luminescence was initiated by 5.15-MeV alpha particles. The momenta from the photomultiplier were fed to a pulse-height analyzer.



Amplitude of luminescence in xenon at different E/p. 1 - gaseous xenon, density 0.5 g/cm^3, t = 20°C; 2 and 2a - liquid xenon, 1.74 g/cm^3, +10°C; 3 and 3a - liquid xenon, 2.07 g/cm^3, -5°C.

The figure shows the results of measurements of the luminescence in liquid and gaseous xenon at different values of E/p, where p is the pressure that would be possessed by xenon of given density were it to be an ideal gas at 300°K, and E is the intensity of the constant electric field.

The characteristic drop in luminescence amplitude (see curves 1, 2, and 3) observed for $E/p < 0.1$ is probably connected with the drawing-out of the electrons from the α-particle trach, which decreases the number of recombinations on the track. The attenuation of the luminescence amplitude was observed earlier in gaseous argon [1] and in liquid helium [2].

The increase in the luminescence amplitude at large E/p is due to the acceleration of an increasing number of electrons drawn out from the α-particle track to energies exceeding the xenon excitation energy.

Curves 2a and 3a characterize the additional increase in the luminescence following application of a pulsed electric field of the same polarity as the constant field. (Pulsed field amplitude ≈2 kV, pulse duration ≈1.5 μsec, delay relative to instant of α-particle passage 150 nsec, distance between electrodes 0.53 mm.)

The presence of an additional increased luminescence in the pulsed field makes it possible, by varying the pulse delay, to determine the electron drift velocity in the liquid xenon. The obtained value $(1.3 \pm 0.5) \times 10^5$ cm/sec (at $E/p = 0.38$) agrees with the electron drift velocity in gaseous xenon [3].

We were thus able to establish the following: (i) The behavior of free electrons in liquid xenon is similar to their behavior in gas. (ii) The electrons produced by the α-particle have a sufficiently long life and can be accelerated by either constant or pulsed electric field to energies sufficient to excite the liquid-xenon atoms.

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MAGNETIC PROPERTIES OF METALS: SOLID SOLUTIONS OF ANTIMONY IN BISMUTH

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In addition to quantizing the spectrum and causing Landau diamagnetism, a magnetic field perturbs the states of bands separated by a small gap and mixes their wave functions. This is as if the bands were to come closer together, so that the occupied states of the lower band increase their energy and make a diamagnetic contribution to the susceptibility, and the states of the upper band, to the contrary, make a paramagnetic contribution [1,2]. Consequently, this mechanism should have the unusual property that maximum diamagnetism should appear in the two-band model in the absence of free carriers, i.e., in the semiconducting situation. Such a simplified treatment of the interband contributions of the susceptibility is based more on intuitive considerations than on rigorous theoretical calculation, so that this treatment, together with the result of its application, calls for an experimental verification. Convenient media for this purpose are bismuth-antimony alloys, in which the required metal-semiconductor transition is realized by a monotonic band displacement resulting from the addition of antimony [3].

The magnetic susceptibility of single-crystal alloys containing up to 14 at.% antimony was investigated in the temperature region 4.2 - 300°K.

The results are shown in Figs. 1 and 2 (the black point in Fig. 1 is taken from [4], and the vertical error bars represent the uncertainty due to the field dependence of χ).

We present below the distinguishing features of the obtained data and the conclusions based on them.