These experiments point to the presence of a spatially-periodic field due to the domains (for details see [5]). The component elements of this structure are domains with magnetization direction along the field, residual domains of much smaller size with magnetization direction opposite to the field, and Bloch walls with magnetization direction perpendicular to the field. This situation is analogous to the case of spatial periodicity of the fields of a magnetic neutron resonator [4]. From the difference between the values of the induction of a sample, corresponding to neighboring resonances, we can determine the period of the residual domain structure $2d = (3.9 \pm 0.9) \times 10^{-2}$ cm. An estimate of the domain dimension for a sample in an unmagnetized state yields $d = 1.5 \times 10^{-2}$ cm [6]. The depth of the resonances depends strongly on the thickness of the Bloch walls. In turn, the thickness of the Bloch walls is determined by the magnetic anisotropy, and consequently also by the temperature. This can explain the influence of the temperature on the depth of the depolarization resonances.

Our experiments thus indicate that the domains have a periodic structure in the case of almost total magnetization of the sample. The experiments show that the presence of periodically disposed Bloch boundaries can lead to resonant depolarization of the neutron beam and yield information needed to determine the period of such a structure.

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ANGULAR DISTRIBUTION OF ELECTRONS RELEASED IN ATOMIC COLLISIONS

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The instrument ensuring the best conditions for obtaining large transmission and high resolution in investigations of the energy distribution of electrons released as a result of ionization collisions is the cylindrical electrostatic analyzer. Such an analyzer was used recently by Melhorn [1 - 3] and by us [4, 5]. A detailed description of the instrument and of the experimental procedure is contained in [6]. As noted there, a major shortcoming of the cylindrical analyzer is the impossibility of analyzing the electrons at scattering angles differing from a fixed angle θ, which is determined by the focusing conditions and equals 54.5°.

To broaden the range of angles θ, we have proposed a method for prior deflection of the electrons with an electric field before they enter the analyzer [6]. We used this method in the present study to investigate the angular distribution of electrons released in collisions

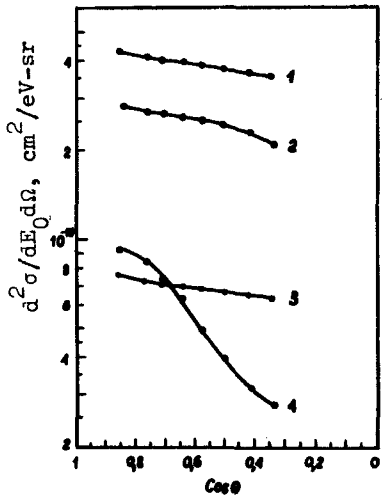

Fig. 1

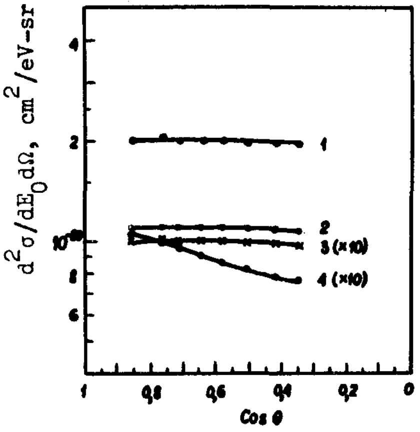

Fig. 2

Fig. 1. Differential electron-production cross section per unit angle $d\Omega$ and unit electron energy interval dE_e, measured in the angle range θ = 30 - 70°, at electron energy E_e = 20 eV and ion energy T = 15 keV.

Fig. 2. The same as in Fig. 1 at electron energy E_e = 100 eV.

of the pairs H^+-Ar, Ne^+-Ar, Ar^+-Ne, and Ar^+-Ar at angles θ ranging from 30 to 70° and at an ion energy T = 15 keV.

Similar investigations, pertaining to interactions between ions and complex atomic particles, have been performed to date only for the H-Ar case at a proton energy T = 300 keV [7] and an emitted-electron energy E_e > 150 eV.

To explain the character of the continuous electron spectrum which remains unclear to date, particular interest attaches to the measurement of the electron angular distribution corresponding to this part of the spectrum, and also to investigations of collisions of more complex atomic systems. Starting from our earlier measurement data [4, 5], we chose the electron energies E_e = 20 eV and E_e = 100 eV, near which there is no structure in the electron energy spectrum.

The measurement results are shown in Figs. 1 and 2, respectively. The ordinates are the absolute values of the differential cross sections, and the abscissas the values of the cosine of the scattering angle in the laboratory system.

As seen from the figures. In the case of H^+-Ar the electron-production cross section decreases continuously with increasing scattering angle θ. This decrease is particularly large at low values of the electron energy E_e (Fig. 1). A similar dependence of the differential cross section on the angle θ was obtained for this pair in [7].

In the case of interaction of more complex atomic particles (Ne^+-Ar, Ar^+-Ne, and Ar^+-Ar), the cross sections for the production of electrons of energy E_e = 100 eV are practically independent of the scattering angle (Fig. 2). When the energy E_e is decreased (Fig. 1), a certain decrease of the cross section with increasing angle θ is observed, most pronouncedly in the case of Ne^+-Ar, which is characterized by a large relative velocity.

The difference between the angular distributions for the H^+-Ar and for the more complex colliding systems is evidence of a difference between the mechanisms governing the continuous part of the electron energy spectrum. In the H^+-Ar case a significant role in the electron production may be played by the process of "Coulomb" ionization due to the interaction between the proton and the atomic electron. An analysis of such processes for the case of simple colliding partners, based on the use of the Faddeev equations [8], shows that the angular distribution of the released electron has a maximum at $\theta \sim 0^\circ$. This feature becomes all the more pronounced, the closer the velocity of the released electron is to the velocity of the impinging proton. The dependence of the electron-production cross section on the scattering angle obtained in this investigation for the H^+-Ar pair agrees qualitatively with the calculation results [8].

In collisions of more complicated atomic particles, the electron release may be connected with ionization processes occurring in the quasimolecule produced when the particles come closer together. It is difficult to expect in this case the presence of any preferred electron motion. The almost-isotropic angular distribution observed by us for the electrons released in Ne^+-Ar, Ar^+-Ne, and Ar^+-Ar collisions apparently confirms this assumption.

Deviation from isotropy with decreasing electron energy E_e can be ascribed to the influence of "Coulomb" ionization processes. This influence, however is small in the case considered by us, since the velocities of the colliding ions are much lower than the Bohr velocity.

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ONE NEW METHOD OF DETERMINING THE DIFFUSION COEFFICIENT IN GAS MIXTURES

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We describe here a new method of determining the coefficient of mutual diffusion in mixtures of two gases from the width of the Mandel'shtam-Brillouin components (MB) in the spectrum of the thermal scattering of light in a mixture of these gases.

As follows from [1], the width of the MB components in the mixture is

$$\delta\nu_{MB} = \frac{\Gamma q^2}{\pi c}\ \mathrm{cm}^{-1},$$

$$\Gamma = \frac{1}{2}\{\Gamma_\eta + \Gamma_\chi + \Gamma_D\} =$$

$$= \frac{1}{2}\left\{\frac{{}^4/_3\,\eta + \eta'}{\rho} + \chi\left(\frac{C_P}{C_V} - 1\right) + \frac{D v^2}{\rho^2 (\partial\mu/\partial C)_{P,T}} \times\right.$$