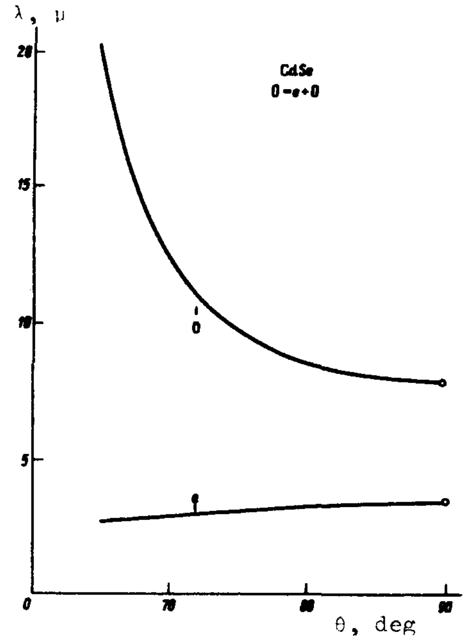

Tuning curves for parametric radiation in CdSe pumped at 2.36 μ. θ is the angle between the pump wave vector and the optical axis of the crystal. The symbols o and e denote the parametric waves of the ordinary and extraordinary polarizations.

the mirrors. The threshold power density required to damage the polished end faces of the crystal was 30 MW/cm^2 at 2.36 μ for a pulse duration 30 - 40 nsec. No sign of damage in the interior of the CdSe was observed.

The presence of 90° synchronism and low internal losses make the CdSe crystal a promising material for parametric generators in the infrared band, with continuous pumping. Estimates of the threshold power from a cw $CaF_2:Dy^{2+}$ laser at optimal focusing yield a value of 150 W for a resonator with feedback at one parametric frequency and 2 W for a resonator with feedback at both parametric frequencies.

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CROSS SECTIONS FOR ELASTIC SCATTERING OF SLOW POSITRONS IN INERT GASES

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Observation of a component of non-exponential type, the so-called "shoulder," on the time spectra of positron annihilation in inert gases [1, 2], uncovers new possibilities of experimentally estimating the cross sections for the scattering of slow positrons ($\lesssim$10 eV by atoms and molecules). In particular, it is possible to obtain the elastic cross sections of positrons in binary mixtures of inert gases. We have measured for this purpose the reduction in the duration of the "shoulder" following addition of lighter inert gases to xenon and argon (Figs. 1 and 2).

It is assumed that the "shoulder" duration $\underline{t}$ determines for the given gas at a density n (cm^{-3}) the time of elastic slowing down of the positrons from the positron production threshold to a sufficiently low energy at which the

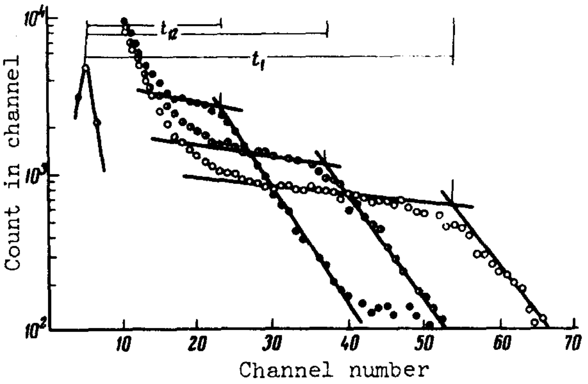

Fig. 1

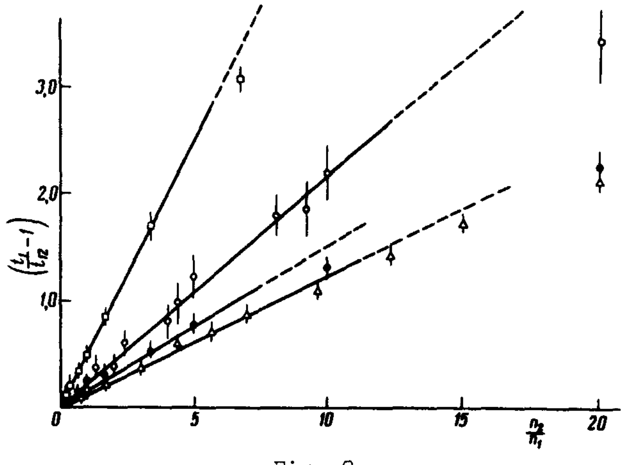

Fig. 2

Fig. 1. Reduction of duration of "shoulder" upon addition of a lighter gas (argon) to the initial gas (xenon). t_1 - duration of "shoulder" in pure xenon, t_{12} - duration of "shoulder" in xenon-argon mixtures. The value of each channel is 1.1 × 10^{-9} sec. o) Xe, p = 3 atm, ◑) Xe + Ar, p = 3 atm, ●) Xe + Ar, p = 10 atm.

Fig. 2. Experimental plots for the determination of the relative elastic cross sections: □) Xe + Ar, ●) Xe + Ne, Δ) Xe + He, o) Ar + He.

polarization interaction leads to a more or less sharp growth of the annihilation rate [1, 2]. The addition of a light gas reduces the duration of the "shoulder" without changing significantly (at relatively low concentrations of the admixture) the energy limits of the elastic slowing down of the positrons, since the threshold for positronium production decreases in a number of inert gases with increasing atomic number, and the polarizability of the atoms increases. Consequently, for a binary gas mixture, the duration of the "shoulder" in connected with the mixture parameter by the relation from the theory of elastic slowing down [3]

$$t_{12} \approx \frac{\text{const}}{n_1\sigma_e^{(1)}\xi_1 + n_2\sigma_e^{(2)}\xi_2}, \quad t_{12} \to t_1, \quad n_2/n_1 \to 0, \qquad (1)$$

where σ_e is the cross section for elastic positron scattering and ξ is the average logarithmic energy decrement. The subscripts "1" and "2" denote, respectively, the heavy and light gas of the mixture. Comparison of t_{12} and t_1 at different admixture concentrations make it possible to obtain the relative elastic cross sections of the positrons.

The measurements were made with a setup having a physical resolution 3 × 10^{-9} sec and a differential nonlinearity 2% of the range up to 200 × 10^{-9} sec. The positron source ($Na^{22}Cl$) on a mica substrate was placed in the center of a cylindrical stainless-steel chamber. The reference (1.3 meV) and annihilation (0.5 meV) γ quanta were registered with USD-4 scintillation pickups with stilbene crystals 40 × 40 mm and with FEU-36 photomultipliers. We used high-purity inert gases with relative polyatomic-gas contamination $\sim 10^{-5}$.

As seen from Fig. 2, in a certain admixture concentration the experimental points fall on straight lines with slope angles ($-\alpha$) that determine the ratios of the elastic cross sections

$$\frac{\sigma_e^{(2)}}{\sigma_e^{(1)}} \approx \operatorname{tg}\alpha \, \frac{M_2}{M_1}, \qquad (2)$$

where M_1 and M_2 are the masses of the heavy and light atoms.

Ratios of positron elastic scattering cross sections in inert gases.

Inert-gas mixture	$\operatorname{tg}\alpha$	$\sigma_e^{(1)}/\sigma_e^{(2)}$
Xenon - helium	0,13 (± 10%)	260 ± 25.0
Xenon - neon	0,15 (± 10%)	44 ± 5,0
Xenon - argon	0.52 (± 6%)	6,4 ± 0.4
Argon - helium	0,22 (±13%)	46 ± 6,0

The results are listed in the table. The obtained positron elastic scattering cross sections agree with the available data for helium, neon, and argon [4 - 6]. Using the absolute values of the positron elastic cross sections for helium, $\sigma_e = 0.023\pi a_0^2 \pm 25\%$ and for neon, $\sigma_e = 0.14\pi a_0^2 \pm 25\%$, obtained in [4 - 5] and recently confirmed by an independent method in [6], and comparing the cross-section ratios from the table, we obtain as an experimental estimate of the average positron elastic cross section in xenon the value $\sigma_e = 6\pi a_0^2$ at energies 1 - 5 eV.

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INFLUENCE OF MAGNETIC FIELD AND OF DEFORMATION ON THE OPTICAL ORIENTATION OF EXCITONS IN CRYSTALS WITH WURTZITE STRUCTURE

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We show in this paper that optical orientation of the exciton should give rise to a number of new effects that distinguish this orientation from that of free carriers [1]. These effects are connected with the fact that excitons, unlike free carriers, have integer spin, and an important role is played here by exchange splitting. The excitons can therefore be polarized not only with light of circular polarization, but also with linearly polarized light. Accordingly, the excitons become either oriented or aligned, in analogy with the situation in cptical excitation of atoms in gases [2].