where $\kappa_1(\omega)$ —coefficient of polarizability of the atom and $\lambdabar = c/\omega$. Since $E_0 \approx H_0$ in a plane wave, the amplitude ratio is $K = E_{eq}/E_0 \approx \kappa_1 E_0/2\lambdabar q$; for example, when

$$\kappa_1 \approx qe / m\omega_a{}^2 \approx 10^{-24}\,\mathrm{cm}^3,$$

$$\lambdabar \approx 10^{-5}\,\mathrm{cm}, \qquad E_0 \approx 10^6 \ \mathrm{V/cm}$$

we have $K \sim 10^{-6}$. The ratio of the intensity of radiation of the second harmonic to the intensity of light scattering is equal to

$$\frac{I_{2\omega}}{I_\omega} = \frac{P_{2\omega}^2 (2\omega)^4}{P^2 \omega^4} = 16 \left(\frac{\kappa_1(2\omega)}{\kappa_1(\omega)} \frac{E_{eq}}{E_0} \right)^2 \sim \left(\frac{E_0}{\lambdabar} \right)^2$$

and does not depend on the dimension of the small inhomogeneities.

In the presence of many inhomogeneities (drops, fog, clouds, bubbles in liquids, fluctuations, dust) a noticeable radiation at double the frequency should be observed, and should be readily separable from the intense scattered light. This separation is especially easy if the fundamental frequency lies in the invisible infrared band while the second harmonic falls in the visible part of the spectrum.

For small inhomogeneities $(a < \lambdabar)$ the second-harmonic radiation intensity depends very strongly on the dimension of the inhomogeneities $I_{2\omega} \sim a^6$, but for $a \gg \lambdabar$ this radiation is weakened by interference and is not observed in the case of a homogeneous isotropic nonlinear medium, in which, as is well known, the second harmonic is not generated. The angular distribution of the second-harmonic radiation over the inhomogeneities differs from the scattered light, since the dipole of the harmonic has a direction perpendicular to the direction of the dipole that gives the scattered light.

The phenomenon under consideration may turn out to be useful not only for a study of dispersion media, phase nuclei, or fluctuations, but also to disclose inhomogeneities produced by an ionizing particle in a bubble chamber or a cloud chamber.

In conclusion I thank corresponding member A. M. Prokhorov and Professor M. S. Rabinovich for useful discussions.

Translated by J. G. Adashko
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INVESTIGATION OF ATTENUATION OF HYPERSOUND IN LIQUIDS BY AN OPTICAL METHOD

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UNTIL most recently experimental investigations of the propagation of hypersound at $\sim 10^{10}$ cps in liquids were carried out almost exclusively by an optical method whereby the fine structure components of the Rayleigh scattering line were measured[1]. These measurements have made it possible to determine the velocity of the hypersound and to observe the sound velocity dispersion in liquids[3,4].

The hypersound attenuation could be estimated only by using these data and relaxation theory[5]. The width of the Mandel'shtam-Brillouin components (shifted fine-structure components of the Rayleigh light-scattering line) is determined by the absorption coefficient of the corresponding hypersound wave[3]. Therefore a direct measurement of the width of the shifted fine-structure components makes it possible to obtain the coefficient of hypersound amplitude attenuation. However, such measurements were hitherto impossible for lack of a sufficiently narrow spectral line to excite the scattered light.

Such a narrow exciting line is now available, and measurement of the half width of the Mandel'-shtam-Brillouin components, and consequently also the absorption coefficient of hypersound, became possible. In this brief note we report on first measurements of this type.

The investigated liquid was illuminated with a beam of the narrow spectral line $\lambda = 6328\,\text{Å}$. The light scattered by the liquid in a direction perpendicular to that of the exciting light was guided to a Fabry-Perot interferometer, back of which was a camera to photograph the fine structure. Photographic photometry of the fine structure photographs yielded the intensity distribution in the fine structure components and their half-widths. The half-width found for benzene is $\delta\nu = 0.01$ cm^{-1} and for carbon tetrachloride $\delta\nu = 0.02$ cm^{-1} (the apparatus half-width is excluded). It is easy to find from these results that the coefficient of hypersound amplitude attenuation of benzene at

f = 4.8×10^9 cps is $\alpha = 7 \times 10^3$ cm^{-1}, while for carbon tetrachloride at f = 3.2×10^9 cps we have $\alpha = 2 \times 10^4$ cm^{-1}.

Recently Cummins, Knable, and Yen[6] carried out a precise experimental investigation to determine the broadening of the Rayleigh line (width of the central fine-structure component) in a dilute solution of polystyrene, and check the feasibility of determining the dimensions of macromolecules from such measurements.

The use of very narrow spectral lines for the excitation of scattering makes it possible to ascertain quantitatively, from measurements in the fine structure components, the attenuation of hypersound, the temperature conductivity, and also the diffusion and dimensions of molecules in solutions.

In conclusion, the authors thank V. P. Zaĭtsev for making possible work with mirrors of multilayer dielectric coating, and E. V. Tiganov for participating in the measurements.

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Translated by J. G. Adashko
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INVESTIGATION OF THE EXCITATION THRESHOLD OF INDUCED RAMAN SCATTERING

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THE existence of a definite excitation threshold is one of the important peculiarities of induced Raman scattering. However, no measurements of the thresholds have been made as yet. In the literature there is only a qualitative indication by Stoicheff[1] that the excitation threshold is lower for CS_2 than for benzene and CCl_4, and is in turn lower for benzene than for CCl_4. Inasmuch as data on the excitation threshold of induced Raman scattering are of considerable interest, we have undertaken a measurement of this quantity to determine its dependence on the parameters of the ordinary Raman scattering lines.

The induced Raman scattering was excited by a ruby generator with pulsed Q switching by a rotating prism. Particular attention was paid in the measurements to strict standardization of all the experimental conditions. To measure the threshold, the beam of the exciting radiation was attenuated with a stack of glass plates placed in front of the cuvette with the investigated liquid. By varying the number of plates we could change in small steps the intensity of the incident radiation, the "threshold" being taken to be the minimum intensity at which induced Raman scattering was still observed. This method, having the advantage of great simplicity, gave a measurement accuracy sufficient for practical purposes (about 10%).

The induced Raman spectra were photographed with a diffraction-grating spectrograph of approximately 13 Å/mm dispersion. Several series of experiments were carried out for each substance. The parameters of the lines in the spectra of ordinary Raman scattering (integrated intensity I_∞, width δ, degree of depolarization ρ) were measured with a photoelectric spectrometer of approximately 5 Å/mm dispersion, with the 4358 Å mercury line used to excite the spectra.

The data obtained for several liquids are listed in the table. The data for the threshold π are given for the first Stokes line. The measurement unit is chosen to be the threshold for benzene.