

was too slow. If this process proceeds via diffusion, then its characteristic time is $\tau \sim \ell^2/D$, where ℓ is in this case the height of the chamber, ~ 5 cm. For our system at $\Delta T \approx 0.1 - 1^\circ\text{K}$, we have $D \sim 10^{-7}$ cm²/sec, hence $\tau \sim 2.5 \times 10^8$ sec ~ 10 years, i.e., a time greatly exceeding the experimental possibilities. In measurements below T_c , the main effect is observed in a layer of ~ 1 cm near the separation boundary, and D can be higher because both phases are far from the critical concentration. At $D \approx 10^{-6}$ cm²/sec we obtain $\tau \sim 10^6$ sec ~ 300 hours, i.e., a feasible experiment time of the same order as the time required to approach equilibrium in our investigations.

The occurrence of a concentration gradient in the surface layer at $T > T_c$ cannot be readily attributed to a simple growth of the absorption layer near the critical point, since the thickness of the layers is in this case larger by several orders of magnitude than the known values [6]. It is possible that the effect is the result of a simultaneous action of gravitational and surface forces. The most natural explanation of the process of drop formation in the surface layer is the assumption of surface lamination of the solution [7], occurring in the initial time interval prior to establishment of equilibrium of the concentration distribution.

- [1] R. Haase, Thermodynamics of Irreversible Processes (Russ. Transl.), Mir, 1967.
- [2] A.V. Voronel' and M.Sh. Giterman, Zh. Eksp. Teor. Fiz. 48, 1433 (1965) [Sov. Phys.-JETP 21, 958 (1965)].
- [3] S.A. Abrukov, Tenevye metody (Shadow Methods), 1962.
- [4] G.A. Somorjai and J.E. Lester, J. Chem. Phys. 42, 4140 (1965).
- [5] Yu.P. Blagoi and V.I. Sokhan, Fizika kondensirovannogo sostoyaniya (Physics of Condensed State), Physico-tech. Inst. of Low Temp., Ukr. Acad. Sci., No. 1, 241 (1968).
- [6] A.N. Rusanov and V.I. Pshenitsyn, Dokl. Akad. Nauk SSSR 87, 619 (1969) [sic!].
- [7] B.Ya. Teitel'baum, Dokl. Akad. Nauk SSSR 65, 3 (1949).

EXCITATION OF SRS IN LIQUIDS UPON Q SWITCHING OF A LASER BY THE INVESTIGATED SUBSTANCE

F.A. Korolev, Z.A. Baskakova, T.S. Zakharova, and V.I. Odintsov
 Moscow State University
 Submitted 10 February 1970
 ZhETF Pis. Red. 11, No. 6, 295 - 297, (20 March 1970).

To excite stimulated Raman scattering (SRS) it is customary to use a laser having a special device for Q switching. In the present investigation we obtained powerful SRS in a number of organic liquids by excitation with a ruby laser whose Q-switching was effected by the investigated substance itself. The employed Q-switching method is based on exciting in the medium a backward stimulated Mandel'shtam-Brillouin scattering (SMBS), leading to reflection of an appreciable fraction of the incident radiation towards the laser. The method was proposed earlier in [1], where a giant pulse was obtained by using CS₂, in which intense SMBS can be easily excited¹).

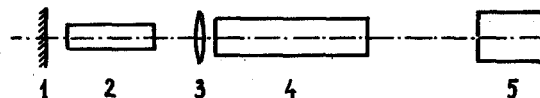


Fig. 1. Experimental setup.

¹) Somewhat different conditions for the formation of a giant pulse in backward SMBS were used in [2], where powerful nanosecond SRS pulses were obtained in compressed nitrogen.

The experimental setup is shown in Fig. 1. Here 1 - mirror with reflection coefficient 99% at $\lambda = 6943 \text{ \AA}$, 2 - ruby crystal 120 mm long, 3 - lens with $f = 15 \text{ cm}$, focusing the laser radiation in the center of a cell 4 (40 cm long) with the investigated liquid, 5 - slit spectrograph.

We used in the investigation benzene, cyclohexane, and carbon tetrachloride, which differ greatly from each other both with respect to excitation of SMBS and with respect to excitation of SRS.

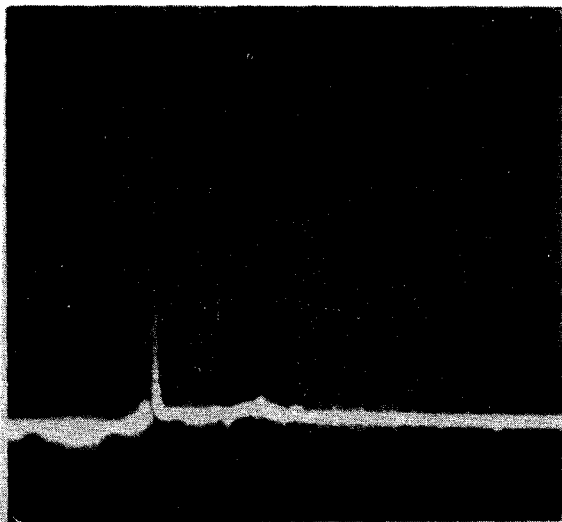


Fig. 2. Oscillogram of pulse incident on medium. Sweep duration 500 500 μsec .

Initially the laser resonator was made up of mirror 1 and the end of the ruby rod. The emission oscillograms (Fig. 2) show that the giant pulse was formed by one of the first free-generation "spikes." The energy of the single pulse incident on the medium was ~ 1.5 and $\sim 1.2 \text{ J}$ for C_6H_6 and C_6H_{12} respectively. The pulse duration at half-height was $\sim 25 \text{ nsec}$ for C_6H_6 and C_6H_{12} and $\sim 20 \text{ nsec}$ for CCl_4 . The high pulse energy is due to the relatively high reflection coefficient of backward SMBS, which greatly decreases the threshold level of the inverted population in the ruby crystal and increases the radiation energy density in the resonator. Spectral investigations performed with the aid of a Fabry-Perot interferometer have demonstrated the presence of several (4 - 5) SMBS components in the radiated pulse. The width of the individual components was $\sim 10^{-2} \text{ cm}^{-1}$, which is much less than the radiation line width in

the free-generation mode (0.35 cm^{-1}).

In benzene, four Stokes components were excited with a shift of 992 cm^{-1} . The power of the strongest, second Stokes component exceeded 15 MW. In C_6H_2 there were excited two Stokes components pertaining to the 2852 cm^{-1} molecular vibration, two Stokes components of 801 cm^{-1} vibration, and also two "combination" Stokes frequencies with shifts $(2852 + 801)$ and $(2 \times 2852 + 801) \text{ cm}^{-1}$. The power of the most intense component with the 2852 cm^{-1} shift reached 20 MW. In CCl_4 , four Stokes components with a shift of 459 cm^{-1} were excited, with the second Stokes component having the largest power ($\sim 10 \text{ MW}$).

It was established that the simple method used in the present investigation to excite SRS in liquids ensures a much higher power of the excited pulse and a more effective excitation of the SRS than a setup with a saturable absorber for laser Q-switching, operating at higher ruby-rod pumping levels.

[1] D. Pohl, Phys. Lett. 24A, 239 (1967).

[2] A.Z. Grasyuk, V.V. Ragul'skii, and F.S. Faizulov, ZhETF Pis. Red 9, 10 (1969) [JETP Lett. 9, 6 (1969)].

ANOMALOUS RESISTANCE OF A PLASMA IN THE CASE OF ION-ACOUSTIC TURBULENCE

G.E. Bekshtein and R.Z. Sagdeev

Submitted 2 February 1970

ZhETF Pis. Red. 11, No. 6, 297 - 300 (20 March 1970)

The so-called anomalous resistance of a rarefied plasma, which has been observed in a number of experiments [1, 2], is attributed to the scattering of