# ANGULAR ANISOTROPY OF FISSION OF NUCLEI LIGHTER THAN GOLD BY 40-MeV α PARTICLE

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We have obtained lasing of a polymethine dye in the wave length range from λ = 1.175 μ by pumping the dye with light flashes from a neodymium-glass laser (λ = 1.06 μ). Lasing of organic dyes (pumped by various methods) was observed heretofore in the wavelength range from λ = 0.5 μ to λ = 0.8 μ [1].

The substance used by us was a solution of one of the analogs of pentacarbocyanine in nitrobenzene [2]. This dye is used as a saturable filter in lasers [2] and in optical quantum amplifiers (OQA)[3] using neodymium glass. As observed by us, the onset of lasing of the dye in the saturable filter exerts an influence on the development of the pulse in the laser and on the waveform of the pulse propagating in the OQA.

The polymethine dye was pumped by a neodymium-glass laser Q-switched with a Kerr cell [4]. The laser emission was incident on a dye-filled cell 10 mm thick (along the pump direction) and 17 mm long (along the dye-lasing direction). The maximum power density of the pump pulse was 18 $MW/cm^2$ and the pulse duration at half-width was 25 nsec. We investigated the spectral, energy, and temporal characteristics of the dye-lasing.

The dye-lasing spectrum consists of two non-overlapping bands: from λ = 1.095 μ to λ = 1.115 μ and from λ = 1.155 μ to λ = 1.175 μ, the second band being obtained only at large dye concentrations. At large concentrations there occurs also an appreciable broadening both of the lasing region and of the absorption band, apparently owing to the broadening of the vibronic levels of the dye molecules. The absence of lasing in the band from 1.115 μ may be connected with the presence of intrinsic absorption of the solvent (nitrobenzene) in this region[1)].

With increasing cavity loss at a constant dye concentration (increase of the generator base or decrease of the reflectance of the output mirror), the long-wave section of the lasing spectrum vanished. With decreasing loss, to the contrary, the short-wave section vanished. Such a change of the spectral composition of the generation with changing cavity loss agrees with the theoretical notions developed in [1].

The largest coefficient of conversion of the neodymium-laser energy absorbed in the solution into the dye-lasing energy (25%) was obtained with a short cavity base (3.8 cm) and at the highest dye concentration used in our experiment ($10^{17}$ $cm^{-3}$). The lasing energy of 2 cc of dye reached in this case 0.25 J at a pulse duration 20 nsec (at half-width). The shape of the dye-lasing pulse duplicates the pump pulse under these conditions. The threshold

[1)] When the nitrobenzene is replaced with methyl alcohol, the dye generates in a continuous band with center at λ = 1.12 μ.

pump power density at high dye concentrations amounted to not more than 1 $MW/cm^2$ and could be lowered by using a cell of good quality. At near-threshold pumping the lasing pulse consists of several spikes each 5 -- 7 nsec long.

An estimate of the gain in the dye at high concentrations yields a value not less than 10 $cm^{-1}$. At such a high gain, naturally, lasing of the dye occurs in a resonator made up of only the glass walls of the cell, as was indeed observed by us experimentally. The divergence of the dye-lasing beam did not exceed $10^{-2}$ rad under the conditions of our experiment. The polarization of the lasing radiation was predominantly perpendicular to the polarization of the pump radiation. The lasing of a polymethine dye explains the changes of the shape of a neodymium-laser pulse passing through a cell with dye, observed in our experiments [3][2)] the smooth pulse passing through the cell acquires a complicated form with several intensity dips. Indeed, the power density of the neodymium laser in [3] (100 $MW/cm^2$) is sufficient at the employed concentrations ($7 \times 10^{16}$ $cm^{-3}$) to excite lasing of the dye by the glass walls of the cell. The lasing occurring in the cell changes in the transmission of the dye, and consequently also the pulse shape.

Analogous pulse shape changes connected with the dye-lasing were observed by us also in the output radiation of a laser in which the polymethine dye was used as a passive shutter for Q-switching.

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[3] N. G. Basov, V. S. Zuev, P. N. Kryukov, V. S. Letokhov, Yu. V. Senatskii, and S. V. Chekalin, ibid. 54, 767 (1968)[27, 410 (1968)].
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## CERTAIN EXPERIMENTS WITH WATER AT HIGH PRESSURES AND TEMPERATURES

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B. V. Deryagin and co-workers [1, 2] reported recently that they obtained so-called "anomalous" or "modified water," which differed greatly from ordinary water in its physical and chemical properties. Judging from the increased viscosity, the higher density, the larger coefficient of thermal expansion, and the sharply reduced saturated-vapor pressure, the authors propose that the changes in these properties are due to the presence of a different structure, determined by the polymerization of the normal molecules of the water [2].

Taking into consideration the much higher density (by approximately 40%) of "modified water," one might attempt to obtain this liquid by applying high pressure, all the more since P. Bridgman advanced at one time [3] the hypothesis that liquid water under pressure

[2)] The polymethine dye was used in [3] as a saturable filter to decouple the amplification stages in a powerful neodymium-glass laser.