In conclusion, it is my pleasant duty to thank N. E. Alekseevskii for directing the work.

[1] N. Bloembergen, Physica 16, 95 (1965).
[2] N. J. Poulis and C. E. C. Hardeman, ibid. 18, 201 (1952).
[3] W. Van der Lugt and N. J. Poulis, ibid. 27, 733 (1961).
[4] N. Bloembergen, ibid. 15, 386 (1949).
[5] S. Wittekoek and N. J. Poulis, ibid. 32, 693 (1966).
[6] T. L. Estle, H. R. Hart, and J. C. Wheatley, Phys. Rev. 112, 1576 (1958).
[7] R. Kh. Timerov and K. A. Valiev, JETP 41, 1566 (1961) and 42, 597 (1962), Soviet Phys. JETP 14, 1116 (1962) and 15, 415 (1962).
[8] R. V. Pound and W. D. Knight, Rev. Sci. Instr. 21, 219 (1950).
[9] W. L. Bond, ibid. 22, 344 (1951).
[10] H. Lipson, Proc. Roy. Soc. A151, 355 (1935).
[11] W. Hofmann, Z. Kirstall. 78, 279 (1931).
[12] A. Abragam, The Principles of Nuclear Magnetism (Russ. transl.), IL, 1963, p. 184 [Oxford, 1961].

* The sign (-) denotes that the local field is directed opposite to H.

COHERENT EMISSION OF InP OPTICALLY EXCITED BY AN INJECTION LASER

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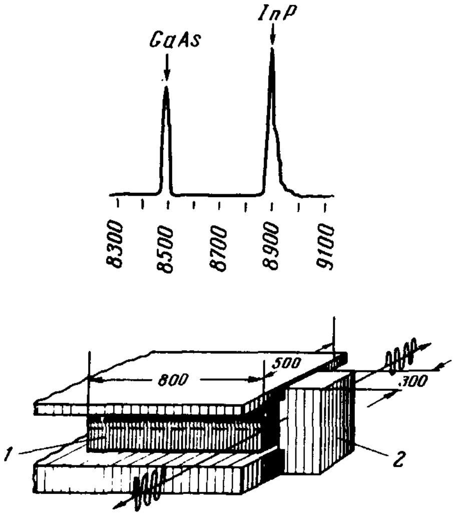
Optical excitation of light generation in semiconductors has already been reported in a number of papers [1-5]. We have obtained for the first time coherent emission in optically-excited indium phosphide. The exciting-radiation source was a GaAs injection laser of the diffusion type. The experiments were made at 77°K.

The injection laser measured 500 x 800 x 200 μ and had a threshold current 8 A. Its coherent-emission wavelength was bout 8500 Å. The diode gave a total light yield of 24 W at a pulsed current of 70 A.

The excited InP sample had a resonator of the Fabry-Perot type with a distance 300 μ between mirrors. The third face of the sample was optically polished strictly perpendicular to the resonator mirrors, and this face of the sample faced the mirror of the injection diode, as shown in the figure. The distance between the diode and the sample was several microns.



Below - arrangement of diode 1 and excited InP sample 2 in experiment on optical excitation of stimulated emission. The dimensions are in microns. The direction of the InP stimulated emission is indicated by the arrows. Above - summary spectrum of the emission in the directions of the arrows of the lower figure.

The sample was glued with a dielectric resin to the diode holder. The laser-illuminated strip on the sample was apparently 10-15 μ wide. The possibility of attaining generation depends in critical fashion on accurately setting the sample in such a way that this illuminated strip is strictly perpendicular to the mirrors.

The sample was cut from a large-block polycrystal of InP doped with tellurium with density 5×10^{17} cm^{-3} and electron mobility 2000 $cm^2V^{-1}sec^{-1}$. Generation set in at an approximate diode current 70 A in one case and at somewhat larger currents in others. A summary spectrum of the emission is shown in the figure. The band connected with GaAs appears as a result of scattering of the coherent emission.

Narrow InP generation lines are seen at 8880, 8900, and 8930 Å. From the average distance between the equidistant maxima we obtained for $(n - \lambda dn/d\lambda)$ a value 5.0 - 6 at 8900 Å, i.e., the same value as for diodes based on InP [6]. Diodes obtained by diffusion of zinc in InP from the same ingot gave generation at 9070 Å, i.e., with a photon energy approximately 30 MeV lower than the largest photon energy obtained by optically exciting an n-type sample. This difference corresponds to the depth of the acceptor level of zinc. We note that for the interband transition [7] at 77°K the wavelength should not exceed 8770 Å, giving grounds for assuming that the observed transitions in n-InP proceed from levels in the donor impurity band to the valence band.

The threshold value of the flux of exciting power was in our case about 0.2 MW/cm^2, which agrees with earlier experiments on optical excitation of semiconductors.

[1] N. G. Basov, A. Z. Grasyuk, and V. A. Katulin, DAN SSSR 161, 1306 (1965), Soviet Phys. Doklady 10, 343 (1965).
[2] N. G. Basov, A. Z. Grasyuk, I. T. Zubarev, V. A. Katulin, JETP Letters 1, No. 4, 29 (1965) transl. 1, 118 (1965); FTT 7, 3649 (1965), Soviet Phys. Solid State 7, 2942 (1966).
[3] R.J. Phelan Jr. and R. H. Rediker, Appl. Phys. Lett. 6, 70 (1965).
[4] I. Melngailis, IEEE J. Quantum Electronics, QE-1, 104 (1965).
[5] N. Holonyak, H. D. Sirkis, G. E. Stillman, and M. R. Johnson, Proc. IEEE 54, 1068 (1966).
[6] N. G. Basov, P. G. Eliseev, I. Ismailov, A. Ya. Nashel'skii, I. Z. Pinsker, and S. V. Yakobson, FTT 8, 2610 (1966), Soviet Phys. Solid State 8, 2087 (1967).
[7] W. J. Turner and W. R. Reese, Radiative Recombination in Semiconductors, Dunod, Paris, 1965, p. 59.

PHOTOSENSITIVE PHASE TRANSITION IN THE FERROELECTRIC SEMICONDUCTOR SbSI

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One of us has previously predicted [1] on the basis of a simple thermodynamic calculation that the Curie temperature of a ferroelectric crystal should shift when the concentration of the nonequilibrium carriers changes. In the approximation of the Landau-Ginzburg theory for second-order phase transitions [2] the magnitude of this shift Δθ satisfies, according to [1], the relation

$$\Delta\theta = -\frac{\Delta E_g C}{\pi P_0^2} N, \qquad (1)$$