PHYSICS

Corresponding Member of the Academy of Sciences of the USSR N. G. BASOV, O. V. BOGDANKEVICH,

1965

SovietRxiv

Fig. 1. Emission spectrum of GaSe at various values of the electron beam. Currents (arbitrary units): 1–1; 2–4; 3–10

Figure 1: Fig. 1. Emission spectrum of GaSe at various values of the electron beam. Currents (arbitrary units): 1–1; 2–4; 3–10

Abstract

Full Text

PHYSICS

Corresponding Member of the Academy of Sciences of the USSR N. G. BASOV, O. V. BOGDANKEVICH,
A. N. PECHENOV, G. B. ABDULAEV, G. A. AKHUNDOV, E. Yu. SALAEV

INDUCED RADIATION IN A GaSe SINGLE CRYSTAL UNDER EXCITATION BY FAST ELECTRONS

In order to determine the possibility of creating an optical quantum generator (OQG), excited by a beam of fast electrons, on semiconductors of the type $A^{III}B^{VI}$, we chose a GaSe single crystal, whose luminescence under such excitation had not been investigated.

The obtaining of an OQG with electron pumping in a CdS crystal was reported in ([1,2]). To study the action of fast electrons, p-GaSe crystals were used, which were obtained by the method described in ([3]) and had an equilibrium carrier concentration of $5 \cdot 10^{15}$ cm^{-3} and a resistivity of $\sim 200\ \Omega \cdot$cm at 300°K. Cleaved single-crystal layers had natural plane-parallel mirror faces. Crystals 0.1 mm thick and less were placed on a cold finger in a cryostat and cooled with liquid nitrogen. An electron beam with an energy of about 200 keV and a duration of 2 μsec was directed onto the cleaved surface of the crystal at an angle of 70°, and the luminescence was observed in a direction perpendicular to the surface. The radiation was recorded on an ISP-51 spectrograph. The emission spectrum is situated in the region from 5870 to 6150 Å, where there are 4 maxima. The maximum intensity lies at a wavelength of 5925 Å, which apparently indicates that the radiation is due to interband recombination. According to ([4]), the forbidden-band width of GaSe at 77°K is 2.09 eV. The most intense maximum with $\lambda = 5925$ Å was studied on a DFS-12 spectrometer at various values of the current.

Fig. 1. Emission spectrum of GaSe at various values of the electron beam. Currents (arbitrary units): 1–1; 2–4; 3–10.

As is seen from Fig. 1, with increasing density of the exciting current there occurs a narrowing of the 5925 Å line. At larger values of the current (curve 3) a shift of the maximum of this line toward longer wavelengths is observed,

which is evidently connected with heating of the crystal.

Silvering of the crystal surfaces leads to an even greater narrowing (almost by a factor of 2) of the 5925 Å line, and in this case additional narrow lines with wavelengths λ 5960 and 5983 Å appear.

P. N. Lebedev Physical Institute
Academy of Sciences of the USSR

Institute of Physics
Academy of Sciences of the AzSSR

Received
21 VIII 1964

CITED LITERATURE

1. N. G. Basov, O. V. Bogdankevich, A. G. Devyatkov, DAN, **155**, 783 (1964).

2. N. G. Basov, O. V. Bogdankevich, Congrès international sur la physique des Semiconducteurs, Paris, 1964.

3. R. F. Mekhtiev, G. B. Abdulaev, G. A. Akhundov, Dokl. AN AzerbSSR, **18**, 11 (1962).

4. G. Fischer, Helv. phys. acta, **36**, 317 (1963).

Note: Figure translations are in progress. See original paper for figures.