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UV AND VUV RADIATION OF RARE GASES AND NITROGEN IN DIFFUSE DISCHARGES, FORMED IN AN INHOMOGENEOUS ELECTRIC FIELD*

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The development of high power VUV and UV spontaneous and stimulated radiation sources is an important task associated with the use of such sources in various scientific and industrial applications. In [1,2], studies of xenon radiation in diffuse discharges formed between two needles by voltage pulses of sub-nanosecond duration were carried out and it was confirmed that xenon dimers produces the highest radiation energy in the region of 120–800 nm.

The data obtained are consistent with the results of our previous work [3] and fundamentally differ from the spectral measurements described in [4, 5]. Besides, parameters of the spontaneous and stimulated emission on the nitrogen second positive system and the conditions in which the emission is observed in [5] is very different from the conditions under which this radiation has been usually produced [6, 7].

In this report we carry out additional studies of the VUV and UV emission of diffuse discharges formed by sub-nanosecond voltage pulses in rare gases and nitrogen. As a result, the optimal conditions for lasing on the second positive nitrogen system were determined and the data were obtained on of Ar_2* and Xe_2* emission both in diffuse and contracted discharges.

The results obtained are shown in Fig.1. It is seen that in a pulsed diffuse discharge, the second continuum of rare gas dimers Ar_2* and Xe^*_2 makes the largest contribution to the VUV radiation energy. In the case of N_2 only week VUV lines are evident, while emission on C-B band of N_2 and that of B-X band of CN are dominated in the UV and visible ranges. Powerful lasing at 337 nm was obtained only with 30 cm long blade electrodes.

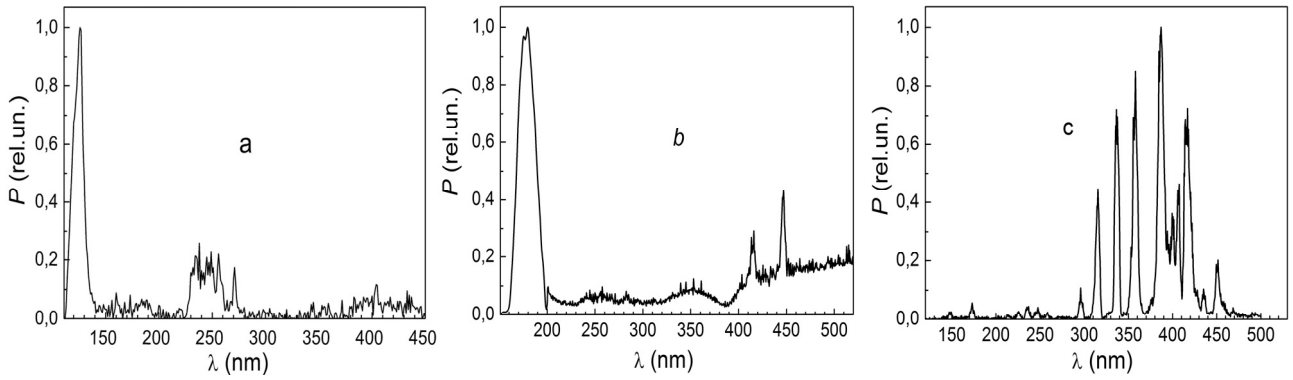

Fig.1. Spectra of diffuse discharges in Ar at 2 Atm (a), Xe at 3 Atm (b) and N_2 at 1 Atm (c). The discharge is formed between two needles by a series of successive voltage pulses with a duration of 0.7 ns, arriving at an interval of 30 ns

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