DIAGNOSTICS OF OPTICAL CHARACTERISTICS OF GAS- DISCHARGE PLASMA IN A MIXTURE OF MERCURY DIIODIDE AND MERCURY DIBROMIDE VAPOR, XENON AND HELIUM

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Gas- discharge atmospheric plasma in mixtures of mercury diiodide vapor and mercury dibromide vapor (HgI_2 and $HgBr_2$), xenon and helium is a working medium of exciplex sources of coherent and spontaneous radiation in the visible spectral range of the spectral bands with a maximum intensity at wavelengths (λ) 444nm and 502 nm. Interest in the study and creation of exciplex sources of spontaneous radiation of visible light source is more effective than the existing ones, which would emit in the range of photosynthetic active radiation (PAR).

The aim of studies was to make a diagnosics of spectral, energy and temporal characteristics of radiation and parameters of gas-discharge plasma in mixtures of mercury diiodide and mercury dibromide vapor, xenon and helium, to identify regularities in these characteristics and to determine the partial pressures of the mixture components at which the maximum power of the radiation in the violet- blue -green spectral range is reached.

Plasma was created by barrier discharge in the device with the construction similar to that used in studies [1]. In this device the inter-electrode distance (was 0.015 m), the length of the electrodes (0.2 m) and working volume (was equal to 111 cm^3). Diagnostics of spectral, temporal and energy characteristics of the radiation of gas-discharge plasma was carried out on the experimental setup description of which is presented in our article [1].

It was established that the spectrum of the radiation source consists mainly of overlapping spectral emission bands with a maximum intensity at a wavelengths (λ) 444nm and 502 nm (with close intensities) of mercury monoiodide and monobromide molecules in the range 370-510 nm and the mercury line at 546 nm, and the xenon line at 823 nm (Fig.1). The pulses of the discharge current had different polarities, amplitude of 265 A and a duration of 150 ns. The radiation pulses of the HgBr * and HgI * molecules have a two-humped time dependence. The amplitudes of the pulses of current and radiation coincide in time. The amplitude of the second pulse is higher than the first. Specific average power of the radiation from the working volume reaches 54 mW/cm^3 and a pulse 70 W / cm^3 at a pump pulse repetition rate 18 kHz. Over 90% of the radiation power is in the violet- blue-green spectral region.

[1]. A A Malinina, A N Malinin, A K Shuaibov, "Optical characteristics of a HgBr excilamp", Quantum Electronics, 2013, **43** (8), 757–761.