RADIATION CHARACTERISTICS OF A MULTICOMPONENT PLASMA ALKALI METALS MERCURY AND INERT GASES

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The construction of realistic models of the optical properties of the plasma vapor of cesium, rubidium, mercury, xenon, krypton, and their various combinations, suitable for mass calculations of the spectra in the wavelength ranges 0.180 - 5 m, the temperature of the electrons and heavy particles 0.8- 3 eV and pressures - 0.1 - 2.5 MPa.

The models accounted atoms single- and double positive ions, negative ions of the alkali metals Dimers cesium, rubidium, and mercury. The data on the absorption coefficient corresponding mixtures in relation to the parameters of the plasma in the current literature is extremely scarce.

In the calculations of partition functions and level populations of alkali metal atoms statistical weight of the level is adjusted weight factor determined by the plasma microfield distribution according to Hooper. Amendments to the pressure and the ionization potential of the particles are considered in the framework of the Debye approximation in the grand canonical ensemble. Separates the region of temperatures and pressures at which condensation of metal vapors.

The spectral absorption coefficient calculated from the photoionization of atoms and ions, the inverse of inhibitory processes in the fields of neutral and charged particles, and the discrete spectrum. Takes into account the basic terms and displacement of the system (for example, to offset XeI -one system for XeII - three). Radial part of the photoionization cross sections of excited s, p, d, f - levels and line strengths for bound-bound transitions in atoms and ions is calculated in the one-electron Coulomb approximation, the wave functions of electrons in the free state is determined by the quantum defect. Levels of higher orbital quantum numbers are considered by hydrogen. Section and line strengths of transitions involving the ground state and the photodetachment cross section of negative ions, cesium and rubidium are calculated or taken from the literature. Selects the most intense lines of all series components, a large number of members of the upper series is taken into account by shifting the integral photoionization threshold.

The contour lines of atoms and ions formed by convolution of Gaussian and Lorentzian profiles. This shock Stark broadening by electrons, taking into account elastic and inelastic collisions, resonance and van der Waals broadening. Whereas the effect of the quasi-static broadening ions. Electronic matrix elements of binary molecules are taken from the literature, the Franck Condon factors are calculated with the Morse potential [1].

The regularities in the emission spectra of pulsed discharges in quartz and sapphire tube with a duration of 100 to 500 ms, and the specific energy of up to 400 kW/cm3, a comparison with literature data and the data of their own experiments. The causes of the existing differences in the number of cases. The spectra were measured with a resolution of 0.07 nm, sufficient to observe effects in the photoionization threshold region with the level and share the contours of the most intense lines.

References

1. Surzhikov ST Optical properties of the gases and plasma. -M .: Izd MSTU. NE Bauman. - 2004.-576 p.