It is often believed that the atmospheric pressure air plasma is in local thermodynamic equilibrium, due to the rapid collision interaction of particles at high pressure. but this assumption is not true for optical diagnostics. there are many reasons why plasma can deviate from thermodynamic equilibrium. for example, the gradients of the velocities, the increased temperature of the electrons, etc.

the article deals with diagnostic methods based on optical spectroscopy and cavitation spectroscopy for measuring temperature and plasma concentration of atmospheric pressure.

the methods described in the article were used for 3 types of air or nitrogen plasma. the first method corresponds to air plasma at low speed. the second type is recombining air and nitrogen plasma with high velocity. the third type is a glow discharge in the air.

the experimental setup consisted of several basic parts: a working area, an optical system, a spectrometer and a computer. the electron concentration was determined by broadening the lines of the Balmer ha hb series. the measurement consisted of line approximation using various broadening mechanisms. ion concentrations are calculated using plasma chemical ratios.

the electron temperature was determined by cavitation spectroscopy or emission spectroscopy. lines of different components were obtained from the radiation spectrum. with the help of known transition energies, electron temperature values were calculated.

the values obtained by these methods are compared with computer modeling of processes. taking into account the errors, the values were compared for different process conditions. These methods can be applied to both equilibrium and nonequilibrium plasma in a wide range of conditions. these are fundamental methods for determining plasma parameters.

Why plasma can deviate from thermodynamic equilibrium?

Which parameters were calculated by this methods?

Why should we using chemical ratios for calculate ion concentration?