

Diagnostics of negative ions in atmospheric-pressure plasmas produced in ambient air

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Atmospheric-pressure plasmas are produced in ambient air frequently. It is speculated that the admixture of oxygen and water vapor in air results in the production of negative ions, but it is difficult to find experimental papers which report the density and the kinetics of negative ions in atmospheric-pressure plasmas. In this talk, we will show our two trials for the diagnostics of negative ions. An experiment was carried out in atmospheric-pressure helium dc glow discharge. We observed the pulsed increase in the discharge current when we injected tunable dye laser beam into the plasma. The pulsed current was due to the production of electrons by photodetachment of negative ions. We identified negative ion species from the threshold wavelength of photodetachment. The other experiment was cavity ringdown spectroscopy in a streamer discharge in air. The weak optical absorption, which was detected by the cavity ringdown, was due to the loss of laser photons by photodetachment of negative ions. We estimated the temporal variation of the absolute negative ion density from the ringdown curve.