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Atmospheric-pressure ionic plasmas in afterglow of atmospheric-pressure discharges in room-temperature air OSAMU SAKAI, YU HIRAOKA, KEIICHIRO URABE, Department of Electronic Science and Engineering, Kyoto University — Ionic plasmas, which have been studied in collisionless cases so far, are theoretically analyzed and observed in experiments in atmospheric pressure gases at room temperature. Although their densities are fairly low, collective motions of positive and negative ions with charge neutrality lead to several unique properties such as broad ion mass spectra, frequency-dependent dielectric constant, and very long life time around a few seconds. One possible situation in which atmospheric-pressure ionic plasmas is observed is in an afterglow phase of atmospheric-pressure discharges with weakly-ionized plasmas. During the discharges, electrons and positive ions are present as majority species of charged particles, and some of the electrons attach to neutral atoms and/or molecules to form negative ions. Via adjustment of charge density balance, such ionic plasmas are composed of positive and negative ions. From analysis on their dielectric properties in the fluid model, the dielectric constants are predicted to be similar to those in the Drude type, which are confirmed in a few specific experiments.

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