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Electron ranaway and ion-ion plasma formation in afterglow low-pressure plasma of oxygen-containing gas mixtures[1] ANATOLY KUDRYAVTSEV, EUGENE BOGDANOV, NIKOLAY KOSYKH, SERGEY GUTSEV, St. Petersburg State University — Experimental investigation of temporal evolution of charged plasma species in afterglow plasma of oxygen-containing mixtures have been investigated. The probe VAC and the time dependence of the saturation positive and negative particles currents to a probe in a fixed bias voltage were performed. The decay of afterglow low-pressure electronegative gas plasmas take place in two distinct stages (the electron-ion stage, and the ion-ion stage) as it was shown in [1] for pure oxygen. In the first stage, the negative ions are locked within a discharge volume and plasma is depleted of electrons and positive ions. The electron density decay is faster, than exponential, and practically all electrons leave plasma volume during finite time followed by the ion–ion (electron-free) plasma formation. The decay of the ion-ion plasma depends on the presence of detachment. With a large content of electronegative gas (oxygen) in a mixture, when there is a "detachment particles," a small fraction of the electrons appearing as a result of the detachment continue to hold all negative ions in the discharge volume. In this case, the densities of all charged plasma components decay according to the same exponential law with a characteristic detachment time. At a low oxygen content in the gas mixture there is no detachment and plasma decays by an ion–ion ambipolar diffusion mechanism.

[1]. S.A.Gutsev, A.A.Kudryavtsev, V.A.Romanenko. Tech.Phys. 40, 1131, (1995).

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