CURRENT PULSES OF NEGATIVE CORONA DISCHARGE

V. I. Chyhin

National University 'Lviv Politechnic“
(12, S.Bandery Str., Lviv 79013, Ukraine)

S u m m a r y

The paper presents the results of experimental and theoretical investigations of the current pulsation of the negative corona in a flow of electropositive and electronegative gas mixtures at ambient pressure. The detailde numerical modelling of negative corona current pulses including secondary current oscillations (SCO) is realized, by using the continuity differential equation for the charge fluxes, supplemented by the Poisson's equation for an electrical field in a quasi-two-dimensional space. The analysis of behaviour of the basic plasma functions in application to the pulsing corona in $Ar + O_2$ and $N_2 + O_2$ mixtures in the concentration region from $2 \cdot 10^{-3}$ to 0.04% is carried out, and the physical mechanisms of SCO are grounded for the first time. In addition, the influence of photoprocesses on the parameters of strikingly different pulses in $Ar + O_2$ and $N_2 + O_2$ mixtures is estimated for the first time. It is determined that SCO are resulted in field intensity oscillations in antiphase in the surface region and at the end of the near-cathode sheath. The pulse SCO can transfer in the full modes of the Trichel's pulse. Characteristics of the 'precursor“ and the 'step“ in the leading pulse front are determined by the dynamics of volumetric charges in the sheath, whereas the SCO shape is determined by the variable flow of positive ions to the cathode. In $N_2 + O_2$, the ionization of O_2 molecules by N_2^*-emitted photons leads to an adequate current rise. The pulse trailing part duration and current value are operated by the collisions of O_2^- ions with N_2^* metastables. Such processes are slowed in $Ar + O_2$.