Contribution ID: **3024** Type: **not specified**

O4.301 Theoretical backgrounds of the apokamp-type atmospheric plasma jet in the electro-negative gas medium

Thursday, 11 July 2019 11:10 (15 minutes)

See the full abstract here http://ocs.ciemat.es/EPS2019ABS/pdf/O4.301.pdf

In 2016 the group of experimentalists led by Eduard Sosnin in the Institute of High Current Electronics has been discovered a new phenomenon in gas discharge physics: an extended plasma jet developing perpendicular to the bending point of the arc discharge channel between two electrodes (E.A. Sosnin et al., JETP Lett., 103, 2016). This phenomenon occurs if the discharge ignites between two electrodes, one - is under the high pulse-periodic potential, and the other has floating potential, i.e. connected via a capacitor to a ground. The discharge has been entitled as “apokamp” from Greek από -“off”and καμπη -“bend”). As it was found, a single needle or a conical jet of 6-7 cm length being attached to the bending point of the current channel represents an apokamp. This unusual new type of gas discharge is observed at high (atmospheric) and medium pressures in gas mixtures containing a small portion of an electronegative gas, e.g. oxygen or chlorine. In inert gases, this phenomenon does not exists. It should be noted that depending on the parameters of voltage pulses, the apokamp can be also represented by several plasma jets developing perpendicular to the current channel from the points of its bending (E.A. Sosnin et al., EPJ D, 71, 2017).
We use the deterministic model (”two-moment model”) of a multicomponent discharge plasma to describe a self-sustained periodic discharge in pure oxygen both in the inter-electrode gap and in the surrounding space above the electrodes. To simplify the consideration a 2D-model is used instead of 3D, so the discharge between two plane electrodes with similar to experimental physical conditions has been considered. The high-voltage potential is connected to the pulse voltage source through the 10 kOhm ballast load. The floating potential electrode is connected to the ground through the 10 pF capacitance. The model also includes grounded electrode far beyond the discharge electrodes system. We consider simplified plasma-chemical reactions and species sets for oxygen. Namely, the reduced formulation includes only electrons, neutral molecules O2, positive O2+ and negative O2- single charged ions. The reactions number are restricted to four: electron impact ionization, impact dissociation, electron attachment and ion-ion recombination.

pppo

Presenter: KOZHEVNIKOV, V. (EPS 2019)

Session Classification: LTPD

Track Classification: LTPD