Institute of High Current Electronics SB RAS
Tomsk Scientific Center SB RAS
National Research Tomsk Polytechnic University

6th International Congress on Energy Fluxes and Radiation Effects (EFRE 2018)

Abstracts

September 16–22, 2018

Tomsk, Russia

Tomsk

Publishing House of IAO SB RAS

2018

CONTENTS

20th International Symposium on High-Current Electronics

IEEE NPSS
NUCLEAR & PLASMA SCIENCES SOCIETY

SUBNANOSECOND BREAKDOWN OF A POINT-TO-PLANE GAP AT NEGATIVE AND POSITIVE POLARITIES[1]

D.V. BELOPLOTOV, D.E. GENIN*, D.V. SHTANGOVETS**, V.F. TARASENKO**

** Institute of High Current Electronics, 2/3 Akademicheskii Ave., Tomsk, 634055, Russia, rff.qep.bdim@gmail.com*
*** National Research Tomsk State University, 36 Lenin Ave., Tomsk, 634050, Russia*

In gas discharge physics it is known that the breakdown voltage of gaps with an asymmetric distribution of the electric field strength (e.g., point-to-plane gap) depends on the polarity of voltage pulses. In a quasistatic electric field the breakdown voltage with a negative pointed electrode is approximately twice as high as with a positive one [1]. This effect was called the "polarity effect". The reason for the polarity effect is the shielding of the negative pointed electrode by a cloud of immobile positive ions. In case of the positive pointed electrode, electric field strength is amplified by ions. Due to the development of pulse technology and the widespread use of nanosecond voltage pulsers, more attention was paid to high-voltage nanosecond discharges at high overvoltage. In such discharges, inversion of polarity effect was observed: the breakdown voltage with the negative pointed electrode was less than with the positive one [2–6]. However, at high pressure the ordinary polarity effect was observed [5]. In [5, 6], it was suggested that the inversion of the polarity effect is due to the large time of formation of explosion-emission centers on a flat cathode. Currently, there is no clear understanding of the causes of the inversion of the polarity effect. In this work results of experimental investigations of the influence of polarity on breakdown characteristics in different gases as well as with different cathodes with UV irradiation are presented.

REFERENCES

[1] *Yu.P. Raizer //* Gas discharge Physics. – Berlin, Germany: Springer-Verlag, 1991.
[2] *Yu.F. Potalitsyn // Pulse Discharges in Insulators, G. A. Mesyats, Ed.* Novosibirsk, Russia: Nauka Publishers. 1985. pp. 77–80.
[3] *L.P. Babich, and T.V. Loiko //* Proceedings of XX International Conference on Phenomena in Ionized Gases. Pisa, Italy. – 1991. – V. 2. – P. 46.
[4] *L.P. Babich //* High-Energy Phenomena in Electric Discharges in Dense Gases. – Arlington, TX, USA: Futurepast, 2003.
[5] *T. Shao, V.F. Tarasenko, Ch. Zhang, D.V. Beloplotov, W. Yang, M.I. Lomaev, Zh. Zhou, D.A. Sorokin, and P. Yan. //* Phys. Lett. A. – 2014. – V. 378. – P. 1828–1833.
[6] *D.V. Beloplotov, V.F. Tarasenko, M.I. Lomaev, D.A. Sorokin //* IEEE Trans. Plasma Sci. – 2015. – V. 43. – P. 3808–3814.

[1] This work was supported by RFBR according to the research project №18-32-00103