INFLUENCE OF SCALE FACTORS OF THE DISCHARGE SYSTEM ON THE STABILITY OF ELECTRIC ARCS IN ATMOSPHERIC PRESSURE GAS MEDIA [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2022.49.1.132

Glinov A.P., Golovin A.P., Kozlov P.V.

Institute of Mechanics, Lomonosov Moscow State University, Moscow, RF, krestytroitsk@mail.ru

The work is devoted to the study of high-current (up to 600 A) extended (up to 15 cm) electric arcs of atmospheric pressure on the P-2000 installation of the Research Institute of Mechanics of Lomonosov Moscow State University [1,2]. Unlike works [3-5], this work reflects the results of studies not only in air, but also in other gases, in argon and nitrogen. To carry out experimental studies, a discharge chamber was built, which allows, by displacing air from it and pumping gases, to provide the required composition of the discharge medium. The presence of transparent walls allows high-speed video recording of the discharge in the chamber. High-speed video recording of the discharge gap is synchronized with current and voltage measurements. Pyrometric diagnostics of the electrode temperature and spectral measurements of the characteristics of the discharge plasma in the arc column and near the electrodes were carried out. When an external axial magnetic field was applied, the diagnostics of its components in the discharge chamber over time was provided by SS495A Hall sensors. Computational and theoretical evaluations of the processes were carried out on the basis of the approaches developed in [3,6,7]. A study of the stability of an arc discharge between electrodes at an unstable interelectrode distance and the presence of an external magnetic field and gas pumping was carried out. Data on the influence of the composition of the interelectrode medium on the modes of discharge initiation are obtained and refined. The data on the permissible levels of disturbances in the interelectrode gap, which do not lead to destabilization of the discharge under conditions of discharge in different gases, have been refined. Experiments were carried out at different sizes of electrodes and gaps, and EMF in order to obtain the dependences of the critical electric field (for initiating a stable arc) on the ratio of the effective transverse dimensions of the anode and cathode. The results obtained in this work can be used in the development of systems for the initiation and extinguishing of extended electric arcs and for the optimization (additional high-temperature combustion in a plasma environment) of disposal facilities (including toxic) waste that is difficult to decompose when using traditional chemical technologies [8 ].

The work was carried out at the Institute of Mechanics, Lomonosov Moscow State University (state contract No. АААА-А16-116021110198-5) with financial support from the Russian Foundation for Basic Research (grant No. 18-29-21022).

References

1. Glinov A P, Golovin A P, Kozlov P V, Shaleev K V, Lyubimov G A // J. Phys.: Conf. Ser. 1250(2019) 012019.
2. Glinov A P, Golovin A P, and Kozlov P V// J. Phys.: Conf. Ser. 2055(2021) 012006
3. Glinov А Р, Golovin A P, and Shaleev K V// Prikl. Fiz. 2018 (2) 21
4. German V O, Glinov A P, Golovin A P, Kozlov P V, and Lyubimov G A // Plasma Physics Reports, 2013. Vol. 39. No. 13. p. 1142.
5. Glinov A P, Golovin A P, Kozlov P V // Physical-Chemical Kinetics in Gas Dynamics 2020 V 21(2) <http://chemphys.edu.ru/issues/2020-21-2/articles/916>
6. Glinov A P // Fluid Dynamics, 2015, Vol. 50, No. 3, pp. 322–331.
7. Glinov A P // Fluid Dynamics, 2015, Vol. 50, No. 4, pp. 483–493.
8. Rutberg A F, Vasil'eva O B, Kumkova I I, Safronov A A //TVT, Vol. 51, No. 2, 2013, p. 191.
1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLIX/Pt/ru/HK-Glinov.docx) [↑](#footnote-ref-1)