THE INTERRELATION BETWEEN OF THE GEOMETRY OF THE CHANNEL OF THE FLARE DISCHARGE AND ENERGY CHARACTERISTICS

A.E. Myusova[1,a)], Y.Y. Lutsenko[1,b)]
[1]*Tomsk Polytechnic University, 30 Lenin Avenue, 634050, Russia,*
[a)] aidanamyusova@yandex.ru
[b)] luts@mail.ru

A high frequency flare discharge burning at atmospheric pressure is a plasma channel which surrounded by faint diffusion shell. The flow of high frequency current and the main energy release occurs in the zone of the discharge channel. Therefore, the physical characteristics of the flare discharge are determined by the size and shape of its channel.

The most important characteristic of the discharge is a thermal power. However, to date measurements of the thermal power of the discharge have been carried out, as a rule, without specifying the length of its channel. . In addition, the measurements were limited to the study of discharges with a power not exceeding 200 ... 300 watts. We also note that the lack of reliable experimental data on the relationship between the length of the discharge channel and its thermal power makes it difficult to verify existing theoretical models [1] of the discharge.

This paper presents the results of measuring the thermal power of a flare discharge burning in air , argon, and helium at atmospheric pressure, depending on the length of its channel. The thermal power was determined by summing the heat losses at the discharge electrode, the heat losses in the discharge chamber, and the heat flow of the discharge plasma in the axial direction. The measurement results for a flare discharge burning in air are presented in Figure 1. As can be seen from the figure, the dependence of the discharge thermal power on the length of its channel is linear.

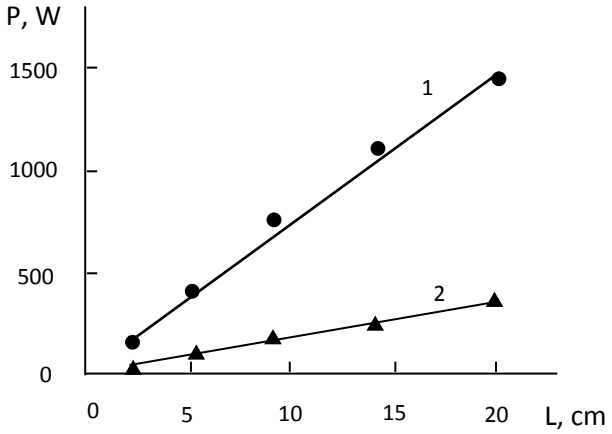

Fig . 1. The dependence of the thermal power of the flare discharge burning in the air from the length of his channel. 1 - total heat power ; 2 - heat losses on the electrode .

The dependence of the heat loss at the electrode on the length of the discharge channel has a similar character. Note that in the case of a flare discharge burning in air, the heat loss at the electrode is 12 ... 15% of the total discharge power. At the same time, for a flare discharge burning in helium, this value is 7 ... 8%. This difference is apparently due to the small value of the gas temperature of the helium plasma.

From the results of the measurements, it also follows that the discharge power is proportional to the cross-sectional area of its channel. Therefore, the diameter of the flare discharge channel is proportional to the square root of its thermal power. Note that this dependence is confirmed by the results of experimental measurements by other authors.

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REFERENCES

[1] *Benilov M.S., Naidis G.V. //* IEEE Transactions on Plasma Science. – 2003. – Vol. 31 – № 4. P. 488-494.