

High-Current Self-Heated Hollow Cathodes with Operation Current more than 25 A. State and Development

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Abstract

Is now designed and is lead up to a high scale of reliability enough plenty of cathodes EP on operating currents up to 10 A. However series of problems, for example, up to conclusion of large geostationary satellites and the projects of overfly on other planets of a solar system, demand creation of more potent cathodes.

We present in the given article a series of outcomes of the two phylums, obtained at tests, of cathodes counted on currents 10... 20 A and 20... 70 A.

Cathodes of a series M20

The cathodes of a series M20 are counted for limiting operating currents up to 30 A at nominal from 10 up to 2 A and consumptions plasma constitutive of gas 0,2... 0,7 mg/sec.

The scheme of a measuring complex was described in [1], the preferred circuit of experiment is submitted(shown) in a fig. 1. In a fig. 2 the volt-ampere characteristics less incandescent cathode are shown. We also conducted activities on optimization disruption of the characteristics. In a fig. 3 the voltage variation of a breakdown from the consumption plasma constitutive of gas is rotined. Apparently, that the final version of organization of a flowing channel of the cathode results in essential dilating of range of optimum start. In activity [2] we resultted one of versions of experimental data on dynamics of start of the high-current cathode and its erosive characteristics. Gas dynamic characteristic of this cathode (the fig. 4) is much better, the lag effect does not exceed 1,5 sec.

It gives the basis forecast resource of the cathode about 5000 hours at 10^3 start.

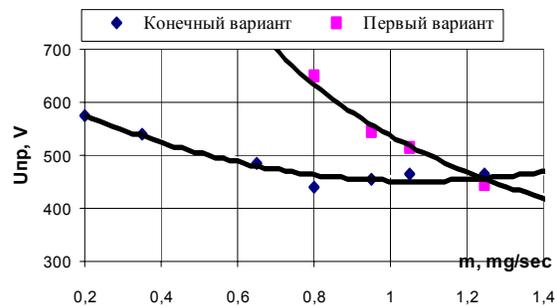


Fig. 3 Breakdown voltage.

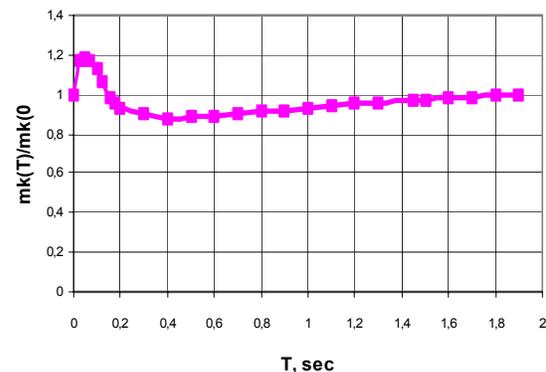


Fig. 4 Re-counted on a technique [3] firing account characteristics.

Basic performances of cathodes of a series M20

Range of operating currents	5...30
Range of operation voltages	12...26
Resource of the cathode, hour	5000
Number of ignition, sec	10^3

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Start time from cold state, sec	< 1
Cathode mass, gramm	< 150

Cathodes of a series on operating currents it is from above 25 A.

This phylum of the cathode was designed on the basis more feeble current of a series M20. Therefore in its designing and manufacturing were taken into account series of positive features of this series. So, for example, practically without change the design of a flowing channel is left. It has allowed to keep disruption the characteristic and firing account characteristic.

However, usage of a tungsten emission tablet with impregnation by energy of a sorption has introduced some essential differences. So in a fig. 5 the volt-ampere characteristics are shown. Apparently reference increase of discharge voltage in the field of 20... 30 A and level 12... 15 V. In a fig. 6 the measurements of a surface temperature of the emitter of the cathode by an absorption pyrometer are shown, the scheme of experiment is shown in a fig. 7.

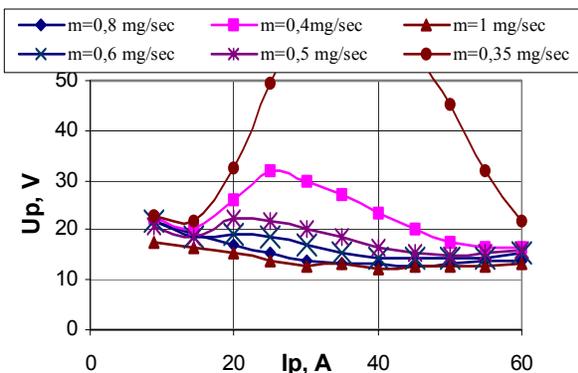


Fig. 5 Volt-ampere characteristics.

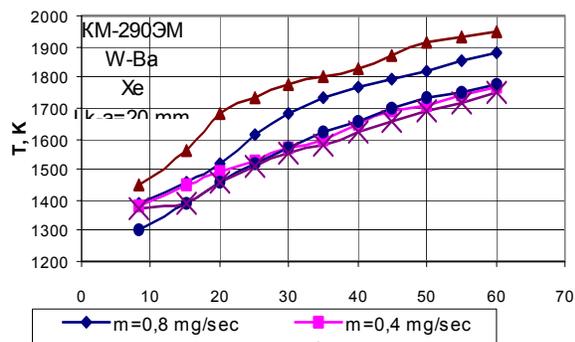


Fig. 6 Measurements of a surface temperature of the emitter of the cathode by an absorption pyrometer.

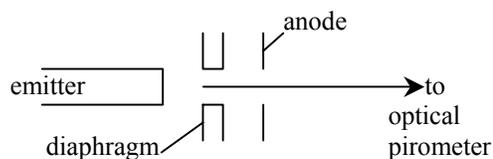


Fig. 7 Schemes of measurement of a surface temperature of the emitter by an absorption pyrometer.

Measurement of parameters of plasma of the cathode on different spacing intervals are shown in a fig. 8.

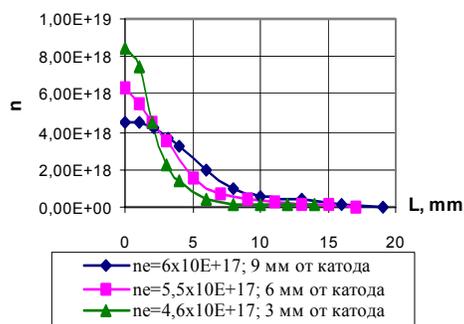


Fig. 8 Measurement of parameters of plasma of the cathode.

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