

INFLUENCE OF MASS FLOW RATE OF ACTIVATOR ON WORK OF GAS
HOLLOW CATHODE.

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Abstract

At construction of gas hollow cathode the question about influence of mass flow rate of activator on the characteristic of discharge is one of main as its stock on the final account defines a cathode resource. On the other hand, though its level on less main gas mass flow rate, coating of activator on current of long-duration operation time (10^4 hours) can appear essential for instruments environmental accelerator. Unlimited decrease of mass flow rate and stock of activator it is impossible since thus activation effect can disappear. On of communication with it there are a task of experimental valuation of influence of activator mass flow rate on work of gas hollow cathode.

Introduction

In course of experiments dependencies voltage of gas discharge on temperature of container with alkaline metal (activator, cesium) (T) were investigated at fixed value of discharge current (2A) and gas pressure ($5 \cdot 10^{-2}$ Torr) in vacuum chamber. Temperature of container with alkaline metal changed from threshold of initiate of internal discharge (150°C) up to a threshold of initiate of main discharge on alkaline metal.

The analysis of experimental curve has shown that it is possible to allocate three of site in dependence on temperature of container with alkaline metal:

1. $150^\circ\text{C} < T < 240^\circ\text{C}$. The voltage of discharge linear decreases at a increase of activator mass flow rate.
2. $240^\circ\text{C} < T < 300^\circ\text{C}$. the voltage of discharge is at level of the fist potential gas ionization (Xe $\sim 12\text{eV}$) and does not depend on the activator mass flow rate.
3. $T > 300^\circ\text{C}$. The arc on vapour of alkaline metal with a voltage about ionization potential initiates.

Hence at small mass flow rate of alkaline metal (10^{-3} mg/s) its increase causes to decrease the voltage of gas discharge. Measurement plasma potential at cathode has shown that decreases cathode potential jump. Energy of ions bombarding a cathode is thus reduced and is increased it resource.

At work of cathode in structure of accelerator increase of the activator mass flow rate causes reduction of voltage of communication with beam. Thus a anode voltage jump grows, since the accelerator feeds on source of constant voltage and increases a specific pulse of accelerator. Described effect was observed in experiments as agreed work of cathode with SPT on base of FAKEL Enterprise and amount to 5-10%.

It is well known that the increase of gas mass flow rate at cathode causes to decrease of discharge voltage. Similarly influences a increase of activator mass flow rate Hence increasing the activator mass flow rate and reducing the gas mass flow rate it is possible to leave by constant discharge voltage but considerably to increase gas efficiency of cathode, since the gas mass flow rate on three-four order exceeds the activator mass flow rate.

Conclusions

Thus the activator mass flow rate do not follows to reduce maximum extreme. It is necessary to evaluate it to the utmost allowable stock (from a condition of allowable pollution) and proceeding from it to develop a cathode on required current having supplied thus maximum thrust and specific pulse.

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