

INFLUENCE OF METAL-HYDRIDE HOLLOW CATHODE ON ENERGY DISTRIBUTION FUNCTION OF IONS EXTRACTED FROM H^+ PLASMA SOURCE

Borisko V.N., Zinov'ev D. V. , Klochko Ye.V.⁽¹⁾, Sereda I.N., Tselujko A. F. ,
Kharkov National University by V.N. Karazin, Kurchatov av. 31, 61108, Kharkov, Ukraine
e-mail: borisko@htuni.kharkov.ua

⁽¹⁾Institute of Mechanical Engineering Problems of NAS of Ukraine, 61046, Kharkov, Ukraine

Introduction

It is promising to apply solid-state hydrogen generators based on metal-hydride in hydrogen vacuum plasma devices. Using electrodes from reversible hydrogen sorbents of $ZrVH_x$ system allows to provide internal feeding of spectral-pure hydrogen in necessary field of a discharge gap [1]. It is efficient to apply such a compound as the material of a hollow cathode in gas discharges. In this case reduction of voltage of hollow cathode exciting mode is observed [2]. In this paper experimental research of influence of metal-hydride hollow cathode from the $Zr_{50}V_{50}H_x$ material on the ion distribution function extracted from reflected discharge are presented.

Result and discussion

The experiments were carried out on a device described in detail at [2]. In the check experiments a reflected discharge with flat metal-hydride cathode $Zr_{50}V_{50}H_x$ and copper hollow cathode with the same geometry were used.

It was shown, that in electrically symmetric reflected discharge with hollow cathode the most probable energy of ions extracted from the discharge corresponds to applied voltage and does not depend on cathode material. It is caused that in this case the mechanism of physical processes flowing in the cavity of the metal-hydride and copper hollow cathode are similar. In the discharge with flat metal-hydride cathode the ion energy is sufficiently lower than with the copper one. It is concerned with increase of ionization frequency of vibrational-excited hydrogen desorbed from the surface of the metal-hydride [3], and as a consequence with decrease of voltage drop near the cathode.

Supplying of a negative bias on the metal-hydride hollow cathode led to decreasing of the most probable energy of the ions extracted from the discharge below the applied voltage unlike from the copper one, where this energy always corresponds to the anode potential. Along with

increasing of the value of negative bias a maximum of distribution function shifted in low energy field unlike to the check discharge. Such a behavior of the ion distribution function is concerned with decreasing of plasma potential in the negative glow at the expense of intensification of hydrogen desorption processes from the metal-hydride. In the experiments with the flat cathodes applying of a negative bias on the cathode did not lead to such a sufficient decrease of the most probable energy of extracted ions.

Conclusions

The experimental investigations of influence of the metal-hydride hollow cathode on the ion energy extracted from H^+ plasma source have been carried out. The possibility of efficient operation of distribution function of the ions extracted from the reflected discharge by means of the negative bias changing on the metal-hydride hollow cathode is revealed.

References

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