ON THE ANOMALOUS EROSION OF THE DISCHARGE CHAMBER OF THE SPТ [[1]](#footnote-1)\*)

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The process of the appearance of local inhomogeneities in the erosion of the insulator of the discharge chamber in the SPT is considered in [1]. It is shown that local inhomogeneities in the erosion of the surface of the SPT discharge chamber walls during its long-term operation have the form of grooves along the direction of ion movement in the output part of the insulator. The slots appear at the beginning of the erosion zone from the side of the anode. With an increase in the duration of the engine operation, the slots deepen and lengthen up to the outlet end of the engine. The width of the slots is on the order of three millimeters. It is known that electrons in the acceleration zone of the thruster move mainly in the azimuthal direction in crossed electric and magnetic fields (Hall effect). The trajectories of electrons in such fields are trochoids [2]. All the trajectories of electrons that leave one point of the trochoid again gather at one point. The distance between these points is equal to the trochoid step. Therefore, the concentration of electrons at these points increases significantly, compared with the concentration on the rest of the trajectory. Electrons, which start at different points of the trochoid at different speeds, are grouped into bunches. In this case, the Hall current consists of rectilinear current sheets with negative charges at a trochoid step distance. The drift velocity in the initial part of the erosion zone is constant. Electric and magnetic forces of interaction between the layers of Hall currents equalize the drift velocity throughout the erosion zone. In this case, negative charge stripes are formed on the surface of the insulator along the direction of the electric field in the motor. The impact of the electric field of these charges on the accelerated ions leads to an increase in the erosion rate of the insulator and the formation of grooves. The width of these grooves is equal to the trochoid pitch. For the characteristic parameters of magnetic and electric fields in SPT, it is 3 mm. At the beginning of the erosion zone, the energy of the accelerated ions of the thruster axis is small. The density of the ions falling onto the wall is greater than that on the final part of the erosion zone. Therefore, abnormal erosion begins at the beginning of the erosion zone. The equality of the azimuthal width of the slots to the trochoid step and the occurrence of anomalous erosion at the beginning of this zone is explained by the presented picture of the occurrence of anomalous erosion.

References

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1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLIX/Pt/ru/GC-Bishaev.docx) [↑](#footnote-ref-1)