KINETICS OF PLASMA-GAS INTERACTION IN THE EXPANDER OF AN OPEN TRAP

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The characteristic feature of open traps is the expander, which reduces the electronic transport of heat. However, the presence of a neutral gas in it can lead to a cooling of the plasma due to the formation of cold electrons as a result of ionization. Current plasma models in the expander cannot describe the interaction of gas and plasma. This paper is devoted to a theoretical study of the redistribution of molecular and atomic hydrogen as a result of interaction with the plasma flowing into the expander. For this purpose, the physical model was constructed. This model takes into account elementary processes leading to the transfer of momentum and energy from plasma to gas, and collisional transport in a neutral gas. Within the framework of this model, a system of kinetic equations with the Boltzmann collision integral and terms describing the particle drain as a result of ionization and dissociation was solved. Distribution functions and radial concentration profiles of molecules and atoms in the entire volume of the expander are obtained. It is shown that under the conditions of the GDL expander, the density of neutrals in the plasma is significantly reduced compared with the initial density of the gas in the expander due to their displacement. This result allows us to explain the evolution of the readings of the density sensors during the discharge of the GDL.