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## PLASMA AS A WORKING FLUID \*)

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Two dates are approaching that determined the beginning of the formation of plasma physics: 150 years since Crookes announced the fourth state of matter and 100 years since this state was called "plasma". Despite numerous applications ranging from household to industrial sectors for where the usage of plasma is critical, the academic content of the concept of "plasma", defined by the works of Schottky [1] and Landau [2], has not changed over the past time. Along with the abundance of evidence of "abnormal" transfer, which sometimes exceeds diffusion by orders of magnitude, at the same time there is a point of view that diffusion remains dominant in plasma transfer as a whole. From Landau's heuristic position that each charged particle in the plasma is shielded by its neighbors, it inevitably follows that there are no fluxes in the plasma in their magnitude comparable to diffusion transfer.

However, since the creation of powerful electric discharge lasers, it has been known that in moderate pressure gas discharge plasma charged particles are introduced into the volume from nearelectrode regions [3], and are not born in the volume under the action of an electronic shock, as in classical low-pressure discharges. The discharge of atmospheric pressure was a new challenge for low-temperature plasma physics [4, 5] and became attractive because of the lack of need for vacuum volumes. Due to the constancy of the parameter of the reduced electric field, the fluxes of charged particles at atmospheric pressures become so significant that their small divergence is sufficient to compensate for losses, while the need for gas ionization in volume disappears [5]. Despite the transparency of the mechanisms for maintaining and forming the structure of the atmospheric pressure discharge [6], it is still believed that the reason for the observed low electric fields lies in the poorly studied stepwise ionization [4]. In addition, due to Landau's hypothesis about shielding, the only source of particles in the volume of a gas discharge is ionization, because of which the mechanism of ionization-overheating instability is necessarily activated and the specific contributions to the volume of the discharge are limited. According to the author, the dominance of ideas about ionization-overheating instability caused the suspension of research aimed at the development of powerful gas discharge devices in our country and abroad [6].

Thus, the plasma theory which developed on the basis of modeling luminous advertising tubes and the propagation of radio waves in the upper atmosphere, and then strengthened by studies of hot plasma, turned out to be completely unsuitable for plasma of medium and atmospheric pressures. With an the plasma-forming gas pressure increase and an excess of from tens to hundreds of Torr, plasma passes from the object of research as an ideal system without interactions between particles into plasma as a working medium, with giant flows of energy and matter passing through it, and the electric current of a gas discharge is one of the most characteristic types of such flows.

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<sup>\*)</sup> abstracts of this report in Russian