DD синтез и генерация плотного вещества на начальной стадии вакуумного разряда

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Abstract. The energetic ions and DD neutrons from microfusion at the *interelectrode space* of a low energy nanosecond vacuum discharge has been demonstrated recently [1]. To understand better the physics of fusion processes the detailed PIC simulation of the discharge experimental conditions have been developed using a fully electrodynamic code [2]. The dynamics of all charge particles was reconstructed in time and anode-cathode (AC) space. The principal role of a *virtual cathode* (VC) and the corresponding potential well formed in the interelectrode space were recognised. The calculated depth of the *quasistationary potential well* (PW) of the VC is about 50-60 kV, and the D^+ ions being trapped by this well accelerate up to energyes needed to provide collisional DD nuclear synthesis. Both experiment and PIC simulations illustrate favourable *scaling of the fusion power density* ($\sim 1/r^4_{VC}$) at decreasing of VC radius for the chosen inertial electrostatic confinement fusion scheme based on nanosecond vacuum discharge. Meanwhile, the initial stage of discharge is understood still rather poorly. When voltage is applied, the electron beam extracted from cathode starts to interact with the surface of Pd anode loaded by deuterium. This early stage of discharge manifests sometime the unusual peaks registered by photomultipliers which are similar to neutron ones from time-of-flight measure used under study of collisional DD synthesis at potential well at the further stages of discharge. The detailed study of Pd anode surface morphology have been performed additionally, and recognized, in particular, the number of various small-scale pores and craters of different sizes. We assume that besides of rather usual craters (due to "electron beams – anode" interaction) some of the craters on the Pd anode surface may belong to *anode ectons* of nuclear origin (ecton is explosive centre [3]., and *cathode ectons* are wellknown especially [3]). Specifics of warm dense matter (WDM) created and ejected by anode ectones as well as the role of micro size pores are discussed. The data obtained are compared with recent results [4] on initiation of DD –reactions by electron beams at deuterium loaded Pd samples and correspondent data on their surface morphology.

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