

Dynamics of Electric Breakdowns on Nanostructured Tungsten Surfaces

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The growth of nanostructures on tungsten surfaces under helium ions irradiation is an intriguing effect that is interesting to consider both from the point of view of controlled nuclear fusion, and concerning a wide range of potential technological applications [1]. The formation of tungsten fuzz enables easier initiation of electrical discharges on the first wall of thermonuclear facilities [2]. Here, we study the dynamics and statistics of the breakdowns that occur on tungsten surface during the formation of nanostructures when it is irradiated with helium ions. Experiments were carried out in Bella RF facility. A planar coil mounted inside a vacuum chamber was used to generate inductively coupled plasma. The operating frequency of the RF power source was 13.56 MHz. In the experiments, bias voltage (pulsed or DC) was applied to W samples during the growth of the nanostructured layer. In order to enable arc detection, a special electric circuit was used, which made it possible to reduce the current and increase the lifetime of arc discharges. The work was supported by the Russian Science Foundation (grant No. 22-12-00274).

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