**Characterization of arcs occurring on nanostructured tungsten surfaces under ion irradiation in an ICP**

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The effect of nanostructure (fuzz) growth on the surface of tungsten when it is exposed to helium ion bombardment from plasma draws much attention both from the nuclear fusion community and from the low-temperature technological plasma researchers. The latter is because of a wide range of potential applications of such nanostructured surfaces [1]. Formation of W fuzz in fusion facilities might lead to easier initiation of unfavorable electrical discharges (arcs) on the wall elements [2]. However, up to now, little is known about the overall correlations between the real structural characteristics of W fuzz, the parameters of He+ irradiation that results in its growth, and the arc triggering modes.

Here, we study the dynamics and statistics of arcing on the surface of tungsten while its surface becomes nanostructured under irradiation with helium ions. Experiments on the irradiation of tungsten samples with helium ions were carried out at the Bella facility that is an inductively coupled plasma (ICP) reactor with a planar radiofrequency (RF) coil mounted inside a vacuum chamber. 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 implemented, which made it possible to reduce the current and increase the lifetime of arc discharges on the sample. We demonstrate preliminary results of analysis of current and voltage waveforms that presumably correspond to arcing events.

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References

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