C4-O-022801

DEPOSITION OF AL_2O_3 IN HIPIMS AND ARC MIXED-MODE*

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Mixed-mode HIPIMS and ARC is a combined method of coating deposition, which is implemented in high-current pulsed operating regimes of magnetron sputtering system [1,2]. After the threshold current is reached, the magnetron discharge transits to an arc discharge, and the lifetime of the electric arc is controlled by the pulse duration. Combining the technology of pulsed magnetron sputtering with an arc makes it possible to provide a high level of ion impact on the substrate and increase productivity. This work is devoted to the study of Al_2O_3 coating deposition processes in mixed-mode. Fig. 1 shows a schematic of the experimental setup and oscillograms of the discharge current pulses, voltage, and the ion current pulses on a substrate in mixed-mode. During the magnetron discharge process, a discharge voltage of approximately 600 V is provided. At the moment of arc formation, the discharge voltage quickly drops to about 100 V and is maintained until the transistor of the high current pulse former is turned off. During this time, the current has time to grow up to 500 A, and the ion current to the substrate located at a distance of 100 mm reaches 6 A. It was found that when operating in the "poisoned" mode, the initiation of an arc discharge can occur during each pulse if the current density on the target surface reaches 0.4–0.6 A/cm^2. The results of a comparison of mixed-mode with MF magnetron sputtering show that in mixed-mode a higher average ion current density on the substrate is provided along with the coating deposition rate and radiation intensity of plasma increasing.

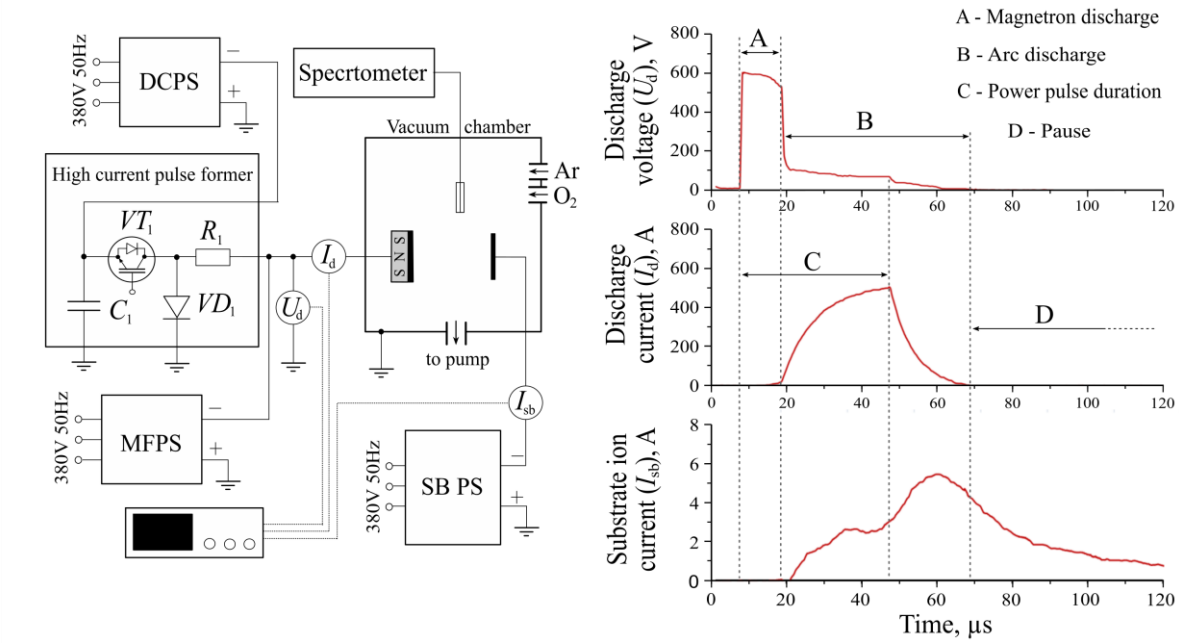

Fig. 1. a) Scheme of the experimental setup for the study of mixed-mode HIPIMS and ARC; b) oscillograms of the discharge current pulses, voltage, and the ion current pulses on a substrate.

REFERENCES

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* This work was carried out with the financial support of Russian Science Foundation (project No.22-29-00627, https://rscf.ru/project/22-29-00627/).