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PLANAR MAGNETRON WITH ELECTRON INJECTION AND REFLECTING ELECTRODE: A RESEARCH APPROACH USING NUMERICAL SIMULATION*

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A high-current planar magnetron is an effective tool for high-quality thin films deposition in high vacuum conditions [1]. The planar magnetron working pressure can be shifted to the lower limit by injection into the main discharge domain the flow of accelerated electrons with independently-adjusted current and energy. According to experiments and numerical simulations [2], the positive effect of the injected auxiliary electrons is mainly caused by the additional independent ionization of residual gas and sputtered target vapor resulting in higher discharge currents, lower discharge voltages, and lower operational pressures. Initial experimental efforts have demonstrated that further improvement of performance of planar magnetron with electron injection can be realized by introducing the additional negatively-biased electrode placed in front of the cathode (target) with the purpose to reflect the stream of the injected electrons, prevent them to escape the plasma-generating discharge volume and finally enhance the degree of utilization of their energy.

This work is dedicated to the numerical study of the physical processes in a planar magnetron with electron injection and reflecting electrode. The research is focused mainly on the revealing the effects of the reflecting electrode parameters on the discharge parameters of the magnetron as well as on the mass-to-charge composition of the ions generating in such configuration.

REFERENCES

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