Target surface state in a hot-target high-power impulse magnetron sputtering process

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The processes of obtaining oxide and nitride coatings in magnetron sputtering systems are associated with the well-known effects of complex nonlinear and often unstable behavior of the deposition rate and stoichiometry of films depending on the reactive gas flow rate. Improvements to existing technologies and the development of new approaches offer opportunities for improving the controllability and productivity of such processes. In particular, there is evidence of a positive effect of a high target temperature on the stability of the reactive magnetron sputtering characteristics [1]. On the other hand, for a long time, independently, several scientific groups have been actively studying the processes of reactive deposition of oxides and nitrides in the high-current pulsed magnetron regimes, which also have favorable effect on the stability of the process. In this work, the combined effects of the hot target and the pulsed power nature of the discharge on the target surface state are analyzed theoretically and supported with the experimental data. We consider previously modified Berg model [2] and discuss the ways of expanding its applicability to take into account the processes of intense target evaporation. The present study is supported by the Russian Science Foundation (grant No. 18-79-10242).

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