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ELECTRON-BEAM DEPOSITION OF THIN FILMS WITH COMBINED PROTECTIVE AND MAGNETIC PROPERTIES BY FORE-VACUUM ELECTRON SOURCES*

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Deposition and characterization of the coatings that combine protective and functional properties is an interesting and relevant task at the interface of modern particle accelerator physics, low-temperature plasma, and materials science [1]. Practical importance of the research of such coatings for engineering sciences is justified by the combination of electrical, magnetic and mechanical characteristics of such coatings. For example, the coatings with higher electrical and heat resistance would have less losses to the eddy currents but heightened mechanical properties (hardness, wear resistance, impact resistance) and, undoubtedly, will be widely used in radio electronics, radio engineering, and the development of absorbing radio protection for unmanned aerial vehicles.

In this work, as the main method for formation of such coatings, we propose to use electron-beam deposition from multi-component beam plasma generated in a medium vacuum (1-100 Pa) [2].

The proposed method seems to be promising since it implies the rapid and controllable electron-beam evaporation of the target followed by layer-by-layer deposition of the coatings with desired properties. This should provide the necessary combination of magnetic and electrical characteristics of the deposited coatings, with their uniformity and high mechanical strength.

This work presents the results of studying of an example of such coatings: a two-layer thin coating with an iron-based functional layer and a protective outer layer based on alumina ceramics.

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