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ELECTRON-ION-PLASMA METHOD FOR FORMING NANOSTRUCTURED MULTILAYER COATINGS ON THE EXAMPLE OF THE TI-B SYSTEM *

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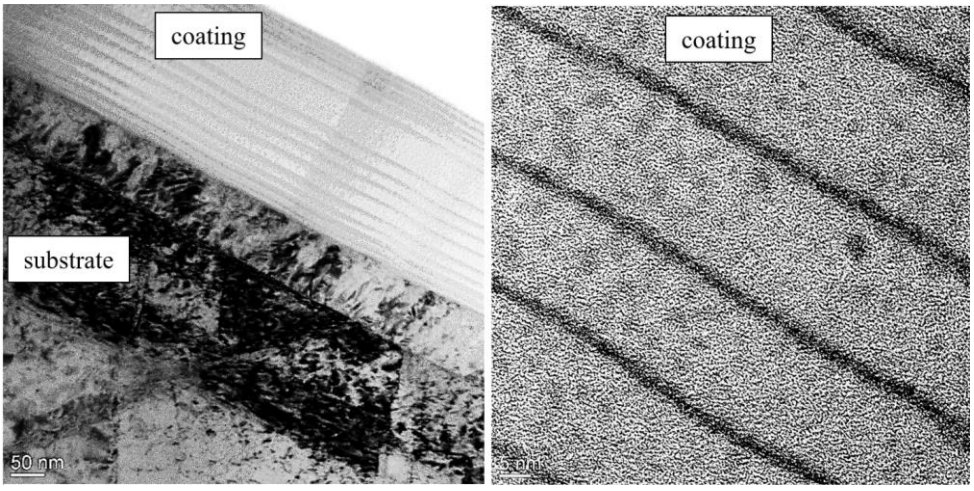
Boron (its nuclide is 10B) is characterized by a high effective thermal neutron capture cross section ($3 \cdot 10^{-25}$ m^2) [1]. Therefore, pure boron, its alloys, and salt solutions are used as neutron-absorbing materials in the manufacture of control rods for nuclear reactors that slow down or stop fission reactions [2]. Boron is also often used as an alloying element in steels used in the manufacture of containers for storing spent nuclear fuel [3, 4].

The aim of this work is to develop an electron-ion-plasma method for the formation of multilayer nanostructured boron-containing coatings using the Ti-B system as an example.

The process of formation of nanostructured multilayer coatings was carried out on the "COMPLEX" installation [5]. Studies of the structure, phase and elemental composition of the film/substrate system were carried out using scanning (SEM 515 Philips device) and transmission diffraction (JEM-2100F JEOL device) electron microscopy, X-ray diffraction analysis (Shimadzu XRD-6000 diffractometer). The mechanical properties of the films were determined by measuring the microhardness (DUH-211S instrument (Shimadzu, Japan), indenter load 10 mN).

It has been established that the coating is multilayer and is in the amorphous-crystalline state (Fig. 1). Ti-B film microhardness 51.0 GPa (standard deviation 7.8 GPa), Young's modulus obtained by microhardness determination 360 GPa.



Pic. 1. Electron microscopic image of the structure of the Ti-B coating formed on steel AISI321.

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