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IN SITU STUDY OF COATINGS STRUCTURE CONTAINING BORON AND OTHER "LIGHT" INCLUSIONS AT MICRON DEPTHS ON THE BASIS OF "REFLECTED ELECTRON SPECTROSCOPY" *)

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The traditional methods of layer-by-layer analysis of multicomponent targets are Rutherford backscattering and layer-by-layer sputtering accompanied by analysis of the component composition using Auger spectroscopy. However, the first method does not allow determining the distribution of the "light" component in the "heavy" component; the second method changes the composition of the sample as a result of the effect of preferential atomization; there are also difficulties in determining the atomization rate of multicomponent samples.

Reflected electron spectroscopy (RES) is a method that is still in its infancy and has not been widely known. This technique is widely used only by three scientific groups [1–3]. The RES method is devoid of all the disadvantages inherent in the above-mentioned approaches. The method is simple in experimental realization, but requires a non-trivial technique of data decoding. In recent years, the technique of deciphering the reflected electron spectra has been significantly improved, which made it possible to increase the accuracy of layer-by-layer profile measurements [3].

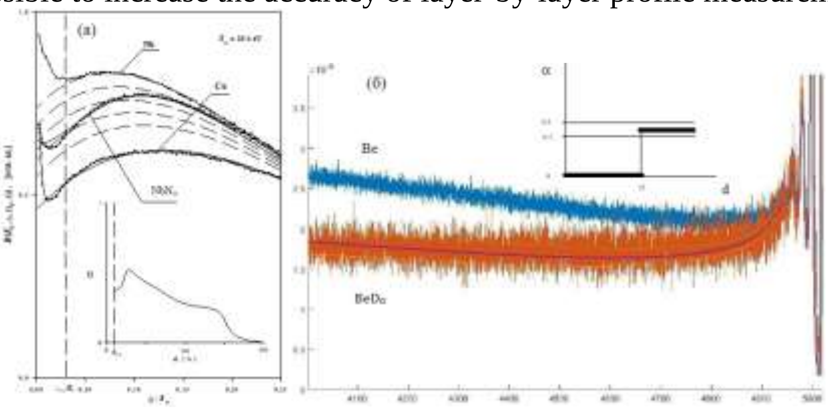

Fig. 1. Energy spectra of electrons reflected from (a): Cu, Nb and NbN_{α}, E_0 = 10 keV; (b): Be and BeD_{α}, E_0 = 5 keV. The angle of incidence is 0°, the angle of reflection is 135°. The embedded pictures show the layer-by-layer profiles of N in Nb and D in Be.

Fig. 1 indicates that the significant variation of the reflected electron signal makes it possible to determine the layer-by-layer profiles of the implanted light impurity in the sample array. The energy spectra were measured with an energy analyzer with energy resolution of 0.7% (a) and 0.03% (b). Such a significant difference in the capabilities of the energy analyzer did not affect the quality of measurement of the implanted atom profiles, which is due to the fact that the information is obtained from a continuum of points on the dome of the spectrum. Determination of the component composition of targets in near-surface layers is performed on the basis of the established Auger and XPS methods. A method is presented that allows us to extend the possibilities of analyzing samples representing the distribution of light material in heavy material at micron depths.

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