Ion-beam analysis of thin-multilayer films on the PET, PES polymer substrate

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The study of the elemental composition and radiation resistance of polymeric functional materials intended for work in a comos is an urgent scientific and technological problem. A deep element profiles of a three types of organic-inorganic functional layers: phthalocyanine (zinc phthalocyanine/ZnPc), non-metallic phorphyrine 95,10,15,20-tetra (4-pyrydil) 21H,23H-porphyne /TPyP) and nucleic acid base (cytosine/C) deposited on the polymer substrates were investigated by RBS method on the EG-5 accelerators (JINR, FLNP). The studies were carried out on beam of He$^+$ ions (2.0 MeV) at incident angles 10^0 and 40^0 and scattering angle $\theta = 170^o$. A SiO_2/Si plate was used as a calibration sample.

The concentrations of the main elements of functional coatings were determined. The RBS spectrums of three groups of samples (fig. 1) have some similar characteristic and common features. The bands of oxygen (O) about channel 400 and carbon (C) about channel 300. These elements exist in the surface layers of the samples. The other observed common characteristic is the shift of the certain elements of the spectrum to low energy region. The destroy occurred in all samples after RBS experiment was observed. This effect can lead to changes the chemical composition on the surface of samples, it also can lead to the formation of an extra layer which enriched with carbon (C) on the surface of samples and the loss of elements such as oxygen (O), hydrogen (H) and nitrogen (N) on the surface of samples.
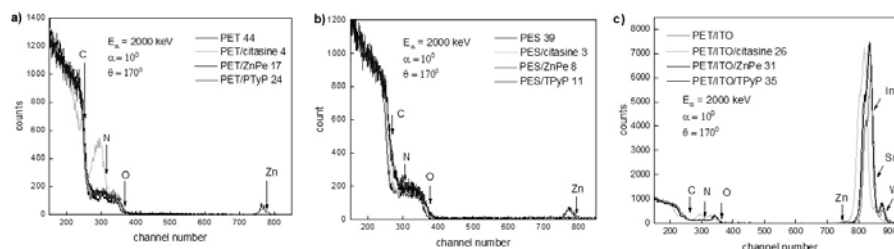

Fig. 1: RBS spectra a) PET samples; b) PES samples; c) PET/ITO samples.