THE CHARACTERISTICS OF CARBON DETECTION WITH USING OF $^{13}C(\gamma,p)^{12}B$ ACTIVATION

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The method for carbon detection was proposed in [1, 2] with registration of produced ^{12}B activity (the life time $T_{1/2} \cong 20.2$ ms) in the $^{13}C(\gamma,p)^{12}B$ reaction [3]. Emission of γ-quanta at decay of ^{12}B produced in the several specific targets was calculated in [4]. For the attempt to realize this method [1] there was given in [5] the model description based on MCNPX-5 [6]. Because of complexity of the task in the present work we checked the results from [5] by the independent estimations of the main method characteristics.

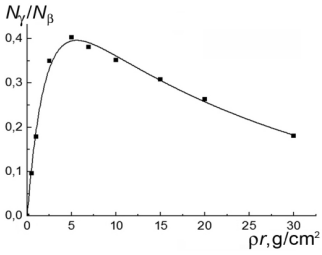

Fig. 1. Total (N_γ/N_β) for emitted γ-quanta at ^{12}B-decay in dependence on target thicknesses ρr.

The calculations in [5] and in this work (according to [7]) of ^{12}B-nuclei quantity produced per an incident 50 MeV electron in the graphite target (5 cm×∅6 cm) both gave about $1.4 \cdot 10^{-6}$. The total flux densities at an End Of Bombardment for γ-quanta caused by ^{12}B-decay in the target from the model [5] and from this work are respectively $\nu_\gamma \approx (0.8$ and $0.5) \cdot 10^{-12}$ cm^{-2}·ms^{-1}. The estimation of ν_γ in this work was made using data per a decay β-particle from [4] and from the present work. There were used spectra in energy E_γ for emitted γ-quanta $(\Delta N_\gamma/\Delta E_\gamma)/N_\beta$ and integrated fluxes of emitted γ-quanta (N_γ/N_β) in dependence on target thicknesses ρr for a set of minimal energies $E_{\gamma\,\min}$. (see Fig. 1. for $E_{\gamma\,\min} = 0$). It is interesting to note that the shape of (N_γ/N_β)-dependence on target thicknesses is similar to that from [8] for incident on targets electrons with energy ≈17 MeV.

The present results confirm the model description [5] and can be useful at optimization of the considered method for carbon detection.

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