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Determining the Presence of the Element 40sa in the Mixture with the Help of (G,Xg/)-Reaction

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Annotation. In this work, using (G,Xg/) reactions in the composition of various compounds, in various fields of medicine. among others, it is shown to determine the presence of element 40Sa, which is widely used in the preparation of medicines in traumatology and orthopedics, in pharmaceuticals**.**

Key words: High dipole resonance, photonuclear reactions, detector, energy state, g-rays, spectrum, nucleus, base substance, spectrometric system, transition energy.

High Dipole Resonance (UDR) phenomenon is the transition of atomic nuclei to the excited state under the influence of radiation produced in accelerators. Studying the nature of these energy levels is one of the ways to study the fundamental nuclear properties of elements. The study of the phenomenon of YUDR allows obtaining theoretical results about the structure of nuclei, as well as information that is useful for practical purposes.

Because the study of this method involves the transition of nucleons and complex particles of nuclei belonging to the 1d2s field to a resonance state with a width of DE≈ 3-5 MeV in photonuclear reactions, and then, when these particles are released, the nucleus is formed in a separate excited state, recording the g-radiation that takes away the energy of the wake. will pass.

Ge(Li)-detectors with very good separation ability, high efficiency, and large usable size were used to record the last nucleus in low energy conditions in the field of γ-ray energy DE =0.6-10 MeV [1]. The energy resolution of the spectrometric system was determined by g-lines of 60Sa radioactive element with 1.173 and 1.332 MeV and 137Cs with 0.662 MeV. The separation capability of the system was equal to 3.4 keV.

The energy grading of the spectrometric system is determined by the clearly expressed g-lines formed by the radioactive isotopes 137Cs, 60So and 24Na (2.753 MeV) in the low-energy field, while the high-energy field is determined by the g-lines formed by the (g,xg/) reactions taking place in the following nuclei ; 16O (5.301; 5.812; 6.180 and 6.323 MeV), 27Al (1.810; 4.710 MeV) and 32S (1.166; 2.230; 3.140 and 3.749 MeV), as well as 208Pb (2.615 MeV) which is formed in the element protecting the detector (n,n/g) It was carried out with the help of γ-lines formed in the reaction.

Figure 1 shows the last excited nuclei in the reactions of 40Sa (g, pg/) 39K, 40Sa (g, ng/) 39Sa and 40Sa (g,ag/) 36Ar produced under the influence of γ-radiation generated in a betatron with energy Emaxg ≈30 MeV part of the resulting spectrum is described [2,3].

Opposite each maximum notch in the spectrum:

1. The sign of the last formed nucleus and the number of nucleons;
2. Transition energy;

3. Registration of γ-waves appearing in the spectrum is mainly carried out by physical processes formed when γ-quanta interact with the used detector material, i.e. photo effect, Compton effect and formation of (e+,e-)-electron-positron pair. If the spectrum formed by the Compton effect is continuous, the photoeffect and (e+,e-) pairs form separate g- teeth. When Eg is ≤1.022 MeV, recording of γ-quanta is mainly due to the photoeffect phenomenon. At Eg≥1.022 MeV, γ-quanta reversal (e+,e-) pair is formed, and γ-waves are formed in the spectrum of Eg, Eg-0.511, Eg-1.022 MeV. The Eg-1.022 MeV notch results from the non-reflection of both photons in the detector and is called double photon extinction (DV dvoynoy vilit). The line with Eg-0.511 is formed due to the photoeffect due to the recording of one photon in the detector and is called the passing of

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one photon (0V-odinarnyy vilit). Eg- is formed due to the return of both photons in the detector (PP-polnoe poglashenie)

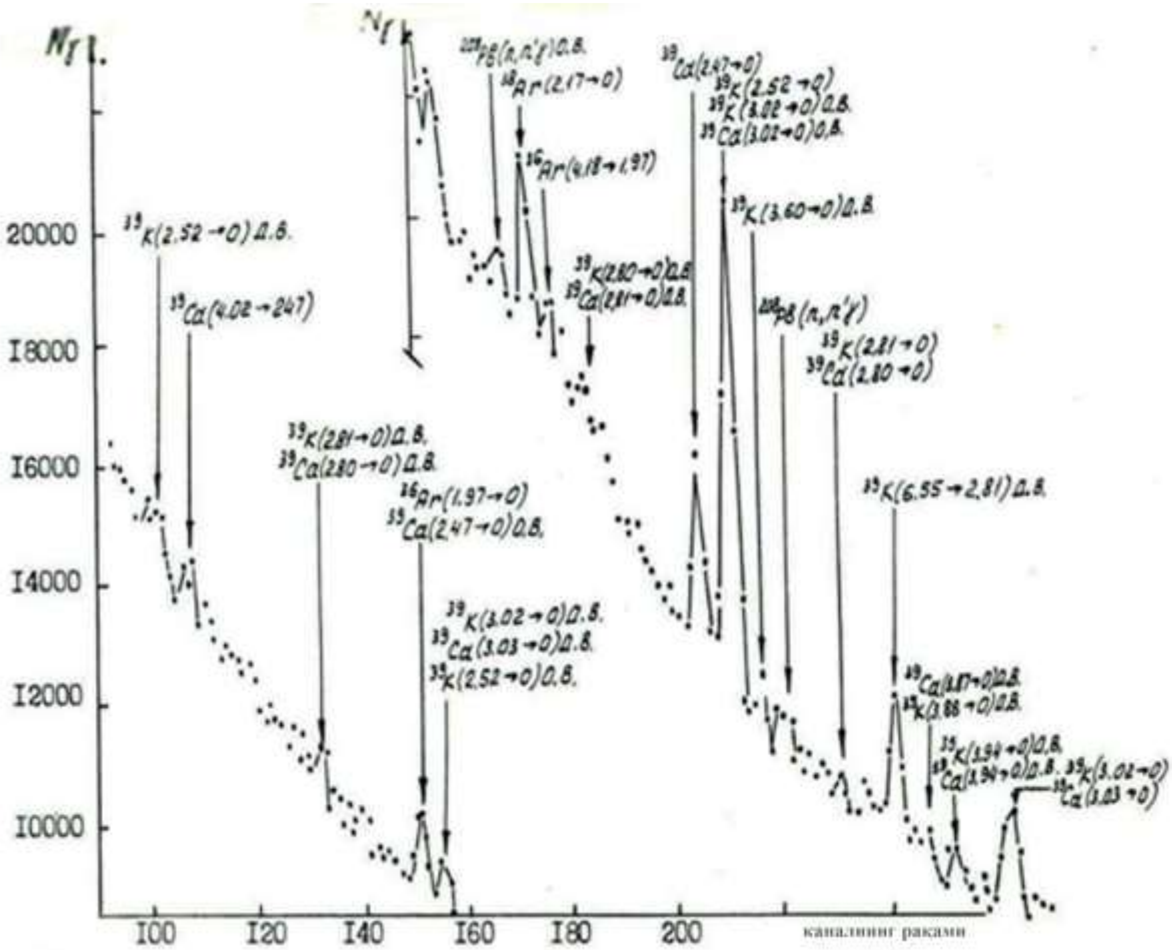

Figure 1. The spectrum of spikes produced by γ-rays carrying the wake energy of the last nuclei during the photodisintegration process.

In addition, in Fig. 1, Ge (n,n/j), Pb (n,n/j), Al (n,n/j), formed as a result of the (n,n/g) reaction occurring in the detector material and the detector g-teeth, which are formed due to the processes taking place in protective equipment, are shown.
When the γ-quanta of the desired mixture (g, xg/) formed as a result of the reaction are recorded on a Ge (Li) detector and the γ-spectrum is analyzed, if γ-teeth corresponding to the reaction of 40Ca (g, xg/) are observed in its composition, then this mixture contains medicine there will be element 40Sa, which is widely used in the preparation of medicines, especially in traumatology and orthopedics
This information is used in the selection of materials for protection against γ-radiation, in the calculation of thickness, in the express analysis of substances in complex mixtures, in the analysis of the photonuclear reaction for nuclei in the 1d2s field, and in checking the purity of isotopes. In addition, it can be widely used in medicine to determine the purity of substances used in the preparation of medicines
To identify the unknown substance in the mixture, a target core called "Sandwich-target" is used. In this case, the unknown substance is mixed with a substance whose emission intensity of secondary γ-quanta is very well studied.
The substance whose output intensity of secondary γ-quanta is known is called "Base substance" and with its help the description of the unknown substance is determined. The use of the 16O isotope "as a reference substance" is reasonable, since the 16O (g, xg/)-reaction has been studied very deeply, and all 16O(g,rg/) 15N and 16O (g,ng/) 15O photonuclear reaction cross sections have extrema at different values of Egmax calculated [4].

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31R, 23Na or 27Al and other nuclei can also be used as the "base substance" used in the article. Because these substances are relatively widespread in nature, photonuclear reactions at different energies have been carried out and are well studied.

Summary. In fact, by analyzing the (g,xg/) spectrum, it was determined that the mixture contains the element 40Ca, and for this purpose, it was confirmed that the 16O(g,xg/) reaction and the elements 31R, 23Na and 27Al can be used "as a base substance".

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