Measurement of Yields and Angular Distributions of γ-Quanta from the Interaction of 14.1 MeV Neutrons with Oxygen, Phosphorus and Sulfur Nuclei

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The study of inelastic scattering of fast neutrons by atomic nuclei is of great importance for fundamental and applied neutron-nuclear physics. Reactions induced by neutrons are the unique source of information for describing the processes of strong interaction between nucleons. Inelastic scattering processes are used to study the characteristics of excited states of target nuclei [1]. The practical use of the (n,n'γ) reaction requires the expansion and refinement of experimental data on this process. Research on the inelastic scattering of fast neutrons has recently become more active in connection with new prospects for the production of nuclear energy using fast neutron reactors.

The purpose of the experiment was to refine the available data on the yields and angular distributions of γ-rays from inelastic scattering of 14.1 MeV neutrons by natural composition of oxygen, phosphorus and sulfur nuclei. The work was carried out within the framework of the scientific program of the international TANGRA (TAgged Neutrons and Gamma RAys) project at Frank Laboratory of Neutron Physics of the Joint Institute for Nuclear Research in Dubna (Russia).

Inelastic scattering was studied by the Tagged Neutron Method [2], in which neutrons with an energy of 14.1 MeV produced in the d(t,α)n reaction are "tagged" by detecting alpha particles. Gamma quanta from the (n,n'γ) reaction were recorded by the "Romashka" multidetector system [3]. Experimental data are shown and discussed in comparison with previously published data.

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