Estimation of the Magnitude and Sign of the ROT Effect for ^{239,241}Pu, ^{241}Am and ^{245}Cm Nuclei at Low Neutron Energy Inducing Their Fission

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The advisability of performing experiments to determine the ROT effect during ternary fission induced by polarized resonant neutrons with the energy of about 0.3 eV in the isotopes ^{239,241}Pu and ^{241}Am is discussed. Theoretical estimates made using modified trajectory calculations [1] show that at these energies one can expect significantly larger effects for plutonium isotopes compared to the ROT effects previously discovered in experiments performed on a beam of polarized neutrons from an ILL reactor with the energy of 4.5 meV.

The ^{241}Am isotope target, which has not previously been used to study the ROT effect, may be interesting in that when used it is expected not only an effect of significant magnitude, but also of the opposite sign with respect to the effects for all four isotopes previously studied at cold neutron energies [2]. Experimental confirmation of the negative sign of the effect will mean the dominant rotation of the compound nucleus of this isotope around the neutron polarization axis counterclockwise.

The negative sign effect can be observed in experiments studying the ROT effect during the ternary fission of the ^{245}Cm nucleus by cold or thermal neutrons.

It can be expected that for the isotopes under consideration, the values characterizing the ROT effect during the emission of γ-quanta or neutrons in binary fission induced by polarized neutrons with E = 0.3 eV will be greater than those already found in binary fission for the ^{235}U target.

References:

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2. A. Gagarski, F. Goennenwein, I. Guseva, P. Jesinger, Y. Kopatch, T. Kuzmina, E. Lelievre-Berna, M. Mutterer, V. Nesvizhevski, G. Petrov, et al., Phys. Rev. C **93**, 054619 (2016).