Contribution ID: **175** Type: **Oral talk (15 min + 5 min questions)**

YIELDS AND ENERGY DISTRIBUTIONS OF α-PARTICLES IN SPONTANEOUS TERNARY NUCLEAR FISSION

Tuesday, 12 July 2022 12:30 (20 minutes)

In [1,2], a virtual mechanism of ternary fission of the nucleus (A, Z) was proposed, which is considered as a two-stage process, when at the first stage an α-particle with kinetic energy T_α close to the height of its Coulomb barrier emits from the specified nucleus, with the formation of a virtual state of the intermediate nucleus (A − 4, Z − 2), which at the second stage is involved in binary fission. Part of the energy of the emitted long-ranged α-particle is taken by reducing the heat of fission of the intermediate nucleus (A − 4, Z − 2) by ($T_\alpha - Q_\alpha$), where Q_α is the heat of the true α-decay of the nucleus (A, Z). The energy distribution $W_{\alpha f}$ and yield N_α of the α-particles, taking into account the proximity of the fission widths of the nuclei (A, Z) and (A − 4, Z − 2) from the configuration (0) of these nuclei with a neck of radius R_{neck} between two fission prefragments, are defined as
W$_{\alpha f} = \frac{1}{2\pi}\frac{(\Gamma_\alpha^A)^0}{(Q_\alpha^A - T_\alpha)^2} = \omega_\alpha \frac{\hbar c\sqrt{2T_\alpha}}{2R_{neck}\sqrt{\mu c^2}} P(T_\alpha); N_\alpha = \int W_{\alpha f}(T_\alpha)dT_\alpha, where (\Gamma_\alpha^A)^0$ is the width of the decay of the parent nucleus from the configuration (0), $P(T_\alpha)$ is the permeability factor of the Coulomb barrier formed by the sum of the nuclear $V_n(r,\theta)$ and Coulomb $V_C(r,\theta)$ interaction potentials of α-particle and deformed fission fragments , ω_α is the probability of α-particle formation in the parent nucleus, μ is the reduced mass of ternary fission products. Calculating the permeability factor $P(T_\alpha)$ of the Coulomb barrier by an α-particle as $P(T_\alpha) = exp(-\frac{2}{\hbar c}\int_{R_A}^{R}\sqrt{2\mu c^2(V_n(r,\theta) + V_C(r,\theta)) - T_\alpha}dr$, when using the deformed Coulomb potential, Saxon-Woods potential and proximity potential [4] for the nuclear potential, the energy distributions and yields of α-particles for ^{248}Cm, ^{250}Cf and ^{252}Cf nuclei are obtained, which are consistent with the experimental energy distributions and yields of α-particles for these nuclei [5 − 6] .

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The speaker is a student or young scientist

No

Section

1. Experimental and theoretical studies of nuclear reactions

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