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THE ALIGNMENT OF THE $^{20}Ne(2^+$; 1.63 MeV) NUCLEUS FORMED IN $^{19}F(\alpha,t)^{20}Ne$ REACTIONS AT $E_\alpha = 30.3$ MeV

Experimental and calculated the $F_2(\theta_t)$ and $F_4(\theta_t)$ alignment angular dependences of the ^{20}Ne nucleus in the excited state 2^+ (1.63 MeV), formed in the reactions $^{19}F(\alpha,t)^{20}Ne$ at energies $E_\alpha = 30.3$ MeV are presented. The orientation parametersF_k ($k = 1,\ldots,2J$) are polynomials in the mean values of the powers $\langle J_z\rangle$ and are included in the expression for the interaction energy of nuclei with an electromagnetic field [1]. Since the method of angular correlations used in this work makes it possible to experimentally determine only even components, we consider the parameters of the quadrupole F_2 and hexadecapole F_4 orientations. In the case of an isotropic spin distribution, the alignment is zero. The maximum value of the parameters is achieved at the maximum value of the spin projection $M = J$ onto the quantization axis:

$F_2 = \frac{2J+1}{\sqrt{5}}\sqrt{\frac{(J+1)(2J+3)}{J(2J-1)}}\langle T_{20}\rangle$,
$F_4 = \frac{2J+1}{6}\sqrt{\frac{(2J+3)(2J+2)(2J+4)(2J+5)}{J(J-1)(2J-1)(2J-3)}}\langle T_{40}\rangle$,
where
$T_{K0} = \frac{1}{2J+1}\frac{\rho_{K0}}{\rho_{00}} = \frac{1}{\sqrt{2J+1}}(-1)^{J-M}\langle JMJ-M|K0\rangle$,
and $\rho_{k0}(\theta_t)$ is the spin tensor component of the density matrix of the nucleus.
Experimental information was obtained on the basis of previously retrieved [2] spin-tensors $\rho_{k\kappa}(\theta_t)$ density matrices of the ^{20}Ne nucleus (2^+ 1.63 MeV) by measuring of the angular particle-gamma correlations. The experimental orientation parameters are compared with the calculated ones under the assumption of CCBA taking into account the mechanisms of nucleon stripping and the coupled channel method (FRESCO code [3]). The calculated alignments are in satisfactory agreement with the experimental ones.

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Section

Experimental and theoretical studies of nuclear reactions

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