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SOME FEATURES OF THE LONG ROTATIONAL BANDS IN HEAVY AND SUPERHEAVY EVEN-EVEN NUCLEI

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In transactinide nuclei the collectivity of low-lying states is greatly developed. This manifests itself in both small (from 42 to 50 keV) of the energies of lowest states $E(2_1^+)$, and in the weak indirect manifestation of quasiparticle excitations. Because of the high collectivity, the yrast-band states in transuranium nuclei can be successfully described 1 up to high spins in the framework of the traditional version of the IBM1. The absence of backbanding (except for the cases of near-semi-magic Th and ^{244}Pu isotopes) also support the hypothesis about high collectivity of the low-energy states in transactinide nuclei. For the nucleus ^{220}Th first backbending is observed at spin $I = 10^+$, when the second one at spins $I = 18^+,\ 20^+$. In ^{244}Pu the backbending is observed at $I = 24^+,\ 26^+$ (fig.1).
In others transactinide nuclei in the best case, there is only some anomaly in the dependence of the moment of inertia from the square of the rotation speed. Such anomaly appear as a nonlinear increasing of the moment of inertia and can be called ''nod up", or more traditionally 2 − ''upbending". Most strongly upbending manifests itself in ^{222}Th, ^{238}U, ^{248}Cm, and ^{252}No (fig.2). In the considered transactinide region the phenomenon of backbending is replaced by upbending. In lighter than actinide deformed nuclei, as a rule, the backbending effect is manifested almost invariably. However, a similar upbending phenomenon was observed and discussed in the microscopic calculation [3] within the framework of the microscopic version of IBM1 [4] for $^{116-120}$Xe. It turns out that in the wave functions $^{116-120}$Xe there is a smooth decrease in the purely collective component, which remains principal up to spin $I = 18^+$.
In the considered transactinide nuclei with $N > 126$, the effect of a soft and very smooth substitution of the collective component in the wave functions with increasing of spin by components containing high-spin pairs occurs at high (of the order $I = 26^+$) spins. There are two reasons for the lack of backbending. First − large values of moments of inertia or small energies of collective states of yrast-bands. The second, which is seen to be especially important for nuclei with high deformation energy, may be connected with the presence of quasiparticle excitations. As a result, the configuration space, in which collective modes are formed, decreases and the bands built on quasiparticle modes shift towards large energies.

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