CROSSING ROTATIONAL BANDS IN SUPERHEAVY EVEN-EVEN NUCLEI

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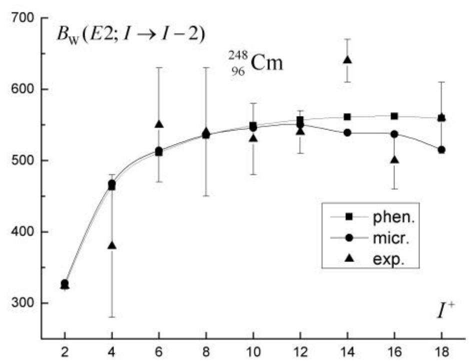
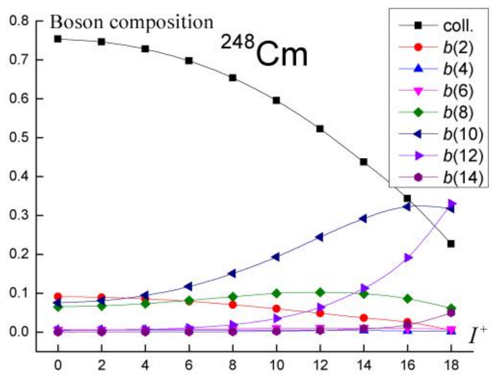
For $Z > 92$ even-even nuclei, with the exception of the $^{244}\mathrm{Pu}$ only, in yrast bands there is no manifestation of the reverse bending of the moment of inertia from the square of rotation frequency (back-bending). This leads to the possibility of reproducing the level energies of yrast bands up to spins values $I^{\pi} = 32^{+}$ in the framework of the IBM1 phenomenology [1]. In present report the structure of the yrast band states was calculated within the framework of the microscopic version of IBM1 [2,3], where bosons with large spins up to $J^{\pi} = 14^{+}$ were used. The calculation was carried out for $^{248}\mathrm{Cm}$, since only for it the values of $B(E2)$ were measured up to high spins. The mapping of phonons to bosons is carried out by the traditional way. The wave functions in the boson representation have the form $\Psi(I) = |\psi_c(I)> + \Sigma\alpha_{i1,c1} |(b^{+}_{i1}\psi_{c1})^{(I)}>$, where $|\psi_c>$ are wave functions containing a superposition of d-bosons only. Moreover, the collectivization is so strong that the number of quadrupole bosons $<n_d> = 19$ in $|\psi_c>$ for the ground state. The Hamiltonian is taken in the form $H = H_{\mathrm{IBM}} + \Sigma\omega_i b^{+}_i b_i + V^{(1)} + V^{(2)} + V^{(3)}$, where H_{IBM} is the IBM1 Hamiltonian with parameters obtained from D-phonons and taking into account renormalizations due to B_{i}, non-collective phonons, $\omega_{\mathrm{i}}-$ energies of b_{i}-bosons. $V^{(1)} \sim d^{+}ds^{+}b,\ d^{+}dds^{+}s^{+}b,\ d^{+}d^{+}sb, d^{+}d^{+}db,$ $V^{(2)} \sim d^{+}d^{+}d^{+}bss, V^{(3)} \sim b^{+}bd^{+}s,\ b^{+}bd^{+}d^{+}ss, b^{+}bd^{+}d$. The parameters that determine the boson operators are calculated based on the microscopic procedure. This leads to precise reproduction of energies up to spin 14^{+} with an error not exceeding a few keV. As can be seen from the presented figure, the reproduction of the $B(E2)$ values by using the IBM1 phenomenology [1] corresponds to the experiment. The composition of the wave functions is presented in the following figure and it shows a smooth replacement of the collective component, built only from d-bosons, by components that include high-spin pairs or $b(J)$-bosons with momentums $J^{(\pi)} = 10^{+},\ 12^{+}$. Such smooth replacement explains the absence of the back-bending and the smooth dependence of $B(E2)$ on spin.





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