INFLUENCE OF PROPERTIES OF SUPERHEAVY NUCLEI ON THEIR ALPHA-DECAYS

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The calculations performed with the modified two-center shell model reveal good agreement between the calculated and experimental values of Q_α. Based on the calculated one-quasiproton spectra and energies for α-decays, one can explain why the α-decay chain of ^{291}117 or ^{287}115 is terminated by spontaneous fission of ^{267}Db. In the α-decay chain of ^{293}117 the α-decay of ^{281}Rg is hindered by the structure effects. The value of T_α becomes longer than T_{sf} and ^{281}Rg likely undergoes spontaneous fission. In addition the number of isomeric states in heaviest odd-Z nuclei were predicted. The α-decays from some of these states seem to be possible.

The spectra and decay of the states of nuclei from the α-decay chain of ^{288}115 were investigated within the independent quasiparticle model. The modified two-center and self-consistent Skyrme single-particle potentials were used. The pairing was treated at the BCS level. The α-transition spectra were obtained and compared with the experimental data.

The special attention was paid to possible E1 transitions in ^{276}Mt observed in the α-decay chain of ^{288}115. Following our analysis, they might be related to the transitions $n9/2[604]\rightarrow n11/2[725]$ and $n11/2[725]\rightarrow n9/2[615]$ in the two-center shell model and to transitions $p9/2[505]\rightarrow p11/2[615]$ in the Skyrme-HF approach. Note that E1 transition $n11/2[725]\rightarrow n9/2[615]$ in the two-center shell model brings ^{276}Mt to the ground state, as assumed in the experimental analysis. Besides the E1 transitions, the strong M1 and M2 transitions are expected in ^{276}Mt in the Skyrme-HF and two-center shell model treatments, respectively. Altogether we see that the models listed above support the existence of E1 transitions in ^{276}Mt but propose for them quite different scenarios. We certainly need here a further theoretical and experimental effort. As for the theory, more involved calculations including the Coriolis interaction, Gallagher-Moszkowski correction and the Newby shift for odd-odd nuclei, and vibrations of the even-even core (with the proper treatment of the Pauli principle) are desirable.