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Structure study of light superheavy nuclei

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Inspired by the newly discovered experimental data, the nuclear structure of the light superheavy nuclei are studied. The single-particle structure, high-K isomers, rotational properties and α-decay energies of the transfermium nuclei are investigated within the framework of the cranked shell model (CSM) with pairing correlation treated by a particle-number-conserving (PNC) method. Particular emphasis will be place on the effect of the deformation. High-order deformation ε_6 plays an important role both in the single-particle orbitals and in the multi-particle states of the transfermium mass region. A reverse of the single-particle energy levels is resulted by including ε_6 deformation, based on which the microscopic mechanism of the identical bands between Lr isotopes is explained. The reflection asymmetric octupole deformation is used to explain the variation of the rotational bands versus the rotational frequency in U and Pu isotopes. Based on the microscopic calculation of the nuclear binding energies, the possible existence of the bound nuclei beyond neutron drip lines are demonstrated, which is driven mainly by the deformations. Pairing reduction of the multi-particle bands in transfermium nuclei is discussed in details.

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