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Single-particle Energies of Superheavy Nuclei and Tests of Theory[1] T.L. KHOO, F.P. KONDEV, I. AHMAD, D. SEWERYNIAK, Argonne National Laboratory — Superheavy nuclei (SHN) exist due to the stabilization from the shell-correction energy, which arises from gaps in the single-particle energies. Hence, knowledge of the single-particle energies is critical for understanding SHN. We have deduced the single-particle energies, which reproduce experimental 1-quasiparticle (qp) energies in odd-A Bk, Es, Cm and Cf nuclei, with corrections for the recoil term. Distinct shell gaps are evident at Z=100 and N=152. Comparisons with models reveal serious shortcomings in the single-particle energies of density functional theories, highlighting the need for improved effective interactions and questioning their predictions of magic gaps for SHN. In contrast, the single-particle spectrum from the "universal" Woods-Saxon potential gives fair agreement, provided deformation parameters (up to at least β_6) are chosen that minimize the total binding energy. Omission of β_6, for example, leads to diminution of the shell gaps and unreliable 1- and 2-qp energies. When properly defined, the Woods-Saxon potential applies for deformed shell-stabilized nuclei from Pu to Lr.

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