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Fission Barriers of Odd-Neutron Heavy Nuclei

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Abstract

The fission barriers of the ²³⁵U and ²³⁹Pu nuclei have been calculated up to beyond the second barrier, for various single particle configurations within a self-consistent Hartree-Fock plus BCS with blocking framework (see Ref. [1] for details on our approach). The genuine breaking of the time reversal symmetry, inherent to the microscopic description of a system having an odd number of fermions, has been taken approximately into account within our mean field approach, so as to yield realistic core polarization effects [1]. To describe the mean field properties, two well-documented parametrizations of the Skyrme interaction (namely SIII and SkM) have been used together with a seniority force for a realistic description of pair correlations. Axial symmetry has been assumed (thus not permitting an accurate description of the first barrier as well known) but the intrinsic parity symmetry has been lifted whenever necessary (beyond the fission isomeric state) as performed in Ref. [2].

We have first assessed the quality of our mean field description for single particle properties in this nuclear region [3] by comparing the spectra of some relevant rotational band heads (calculated within a Bohr-Mottelson approach) with data (mostly for ground state deformations and when available with data in the fission isomeric well). Then the complete fission barriers obtained for various quantum numbers (spin and parity) in both nuclei with both interactions have been calculated and compared within themselves (thus yielding a distribution of so-called specialization energies) and with data.

References

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