

Correlating nuclear masses, radii and E0 transitions

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Improvements of the liquid-drop mass formula are proposed based on the introduction of (i) surface effects in the symmetry and Coulomb energies and (ii) shell effects through the counting of the number of valence nucleons. Inspired by these efforts, similar corrections in the description of nuclear radii are suggested.

To include the influence of deformation on masses and radii requires microscopic modelling. As an example, a systematic study of the spectroscopic properties of nuclei in the rare-earth region is carried out in the framework of the interacting boson model (IBM), leading to an accurate description of the spherical-to-deformed shape phase transition in the different isotopic chains. The resulting IBM hamiltonians are then used for a simultaneous and consistent calculation of nuclear radii and electric monopole transitions with the same effective operator.

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