Masses of Deformed Nuclei with $Z > N$

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Abstract—The masses of $Z > N$ nuclei have been calculated on the basis of the Harvey–Kelson equation for mirror nuclei, where the mass differences for $T = 1/2$ isobaric nuclei are expressed in terms of the shift of the Coulomb energy, ΔE_{Coul}, for isobars with neighboring Z values. The Coulomb energy shift ΔE_{Coul} has been calculated with the aid of a semiphenomenological shell-model expression for diagonal nuclei that takes into account the quadrupole nuclear deformation β_2. Two alternative sets of β_2 values have been used. In one of these, the quadrupole deformation β_2 is calculated on the basis of the Jänecke formula with parameters determined from experimental data. In the second set, the values of β_2 are set to those that are obtained in the microscopic–macroscopic model by optimizing the values of nuclear masses. Either scheme for computing β_2 leads to the conclusion that the effect of deformation is insignificant in the region of nuclei with $Z = 9$–35 and 51–56 and that the masses of nuclides with $Z = 36$–50 and 57–70 are markedly less than the masses of spherical nuclei.