Wigner energy and restoration of isospin symmetry

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The linear term proportional to in the nuclear symmetry energy (Wigner energy) is demonstrated arising from restoring the isospin symmetry, which is spontaneously broken by the isovecor pair field and the isovector part of the nuclear potential. A model that uses an isospin invariant isovector pair interaction in the particle–particle channel, a schematic interaction in the particle–hole channel, and single particle levels from a deformed potential is capable of reproducing the Wigner term as well as the energy distance between the lowest and states in odd–odd nuclei. The model parameters are fixed independently by the standard strength of the isovector pairing and the dependence of the nuclear potential. The pairing correlations are calculated by numerical diagonalization of the pairing Hamiltonian acting on the seven levels nearest the Fermi surface. Implementation of the concept into large–scale nuclear mass calculations will be discussed. Isoscalar pair correlations were included in the same model. The comparison with experiment did not provide evidence for the presence of a substantial isoscalar pair field. Complementary signatures for isoscalar pair correlations will be discussed.

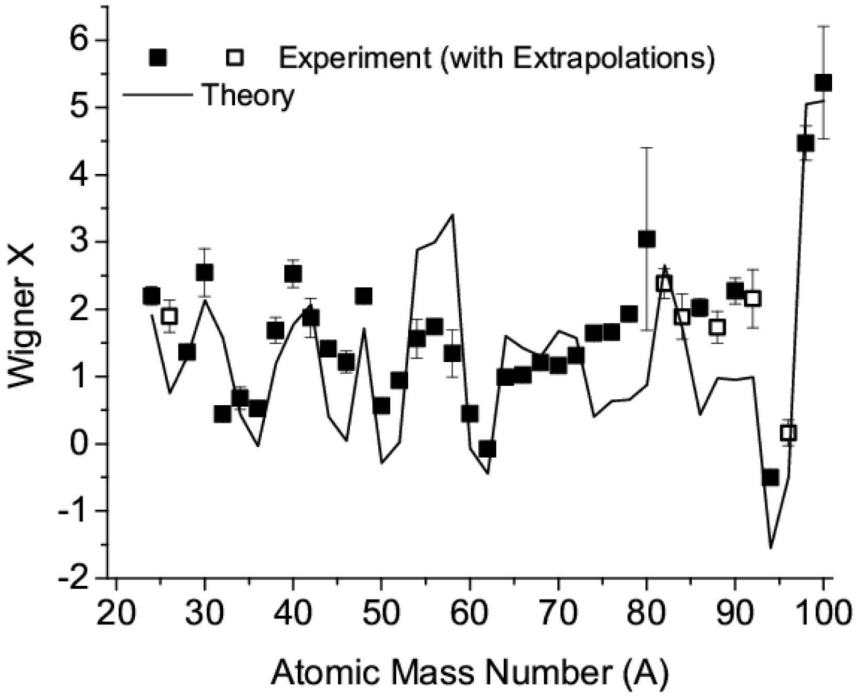

FIG. 1: The linear contribution to the symmetry energy $\alpha_{SYM} = |N - Z|(|N - Z| + X)$.