CORE NUCLEUS POLARIZATION IN Λ HYPERNUCLEI

Abstract

The response of the core nucleus to the Λ in a hypernucleus is studied with a local density approximation. This reproduces the energies and radii of the core nuclei as well as the Λ-single particle (s.p.) energies quite well. The polarizing effect of the Λ depends on the core response through an "effective" compression modulus KA of the nucleus. For a certain class of energy functional, KA is found to be almost independent of the compression modulus K of the infinite nuclear matter. This indeed is a surprising result, and varies with the Hartree-Fock calculations with effective interactions. Reasons for this discrepancy are carefully examined. We consider values of K in the range 100-400 MeV. Furthermore, the polarizing effects also depend critically on D(ρ), the Λ binding in nuclear matter at density ρ. For only a direct ΛN force: D ρ and the core nucleus contracts giving rise to relatively larger core polarization. However, for a "saturating" D(ρ) (with a maximum at ρm<ρ0, where ρ0 is the nuclear matter equilibrium density), which is required to fit the s.p. data, the s-shell hypernuclei binding energies and the low energy Λp scattering data, which results from a ΛN force (including exchange) and ΛNN forces, there may be an expansion of the nucleus with nucleons flowing from the interior to the surface. This is shown to reduce the core polarization effects substantially (for ρm in the neighborhood of ρ0). The resulting changes in root mean square radius and core energy depend on A, but are mostly very small, justifying their general neglect.