The Structure of Nilsson States and Rotational Bands Generated by Spherical Particle-Vibration Coupling in Odd-A Nuclei

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Nilsson states and rotational bands are generated by coupling spherical single particles to the anharmonic quadrupole vibration. Third- and fourth-order anharmonicities are included; also, the coupling to SU(6) anharmonic quadrupole phonons in the SU(3) limit is performed. The systematics of the band structure and the implicit Coriolis coupling are discussed. The calculation provides a simple and transparent mechanism for generating model wave functions of Nilsson states and rotations. For each rotational band the states are grouped into two classes, each of them having a similar structure of the wave functions. It is shown how the maximum alignment of phonons and the averaging over the aligned and nearly-aligned structures plays a basic role in generating rotations. The resulting prolate-oblate symmetry and triaxiality are discussed.