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Bohr Model solution for a shape coexisting potential

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Abstract

The prolate version of the Bohr Hamiltonian with a potential having simultaneous spherical and deformed minima of the same depth is diagonalized in a basis defined through the Bessel-Fourier expansion method [1]. The sextic potential is the lowest order polynomial potential which allows multiple minima and satisfies the Bohr symmetry [2]. When only $K = 0$ states are considered, the condition of degenerate minima restricts the model to a single free parameter connected to the height of the barrier which separates the two minima. The Bessel functions of the diagonalization basis are defined by a boundary value which assures the convergence of the solutions for a fixed basis dimension and barrier height. Studying the evolution of the model as a function of the barrier height, one observed the emergence of features pertaining to shape coexistence in specific intervals of the free parameter [3]. Through extensive numerical applications, this phenomenon was found to originate from the proximity of the barrier to the ground and excited energy levels.

References

[1] H. Taşeli and A. Zafer, Int. J. Quant. Chem. **61** (1997) 759.
[2] R. Budaca, P. Buganu, M. Chabab, A. Lahbas, and M. Oulne, Ann. Phys. (NY) **375** (2016) 65.
[3] R. Budaca, P. Buganu, and A. I. Budaca, under review (2017).