NUCLEAR THEORY, Vol. 43 (2026)
eds. M. Gaidarov, N. Minkov, Heron Press, Sofia

Bohr-Mottelson Hamiltonian with octic potential and the shape coexistence phenomenon

R. Budaca[1,2], **P. Buganu**[1], **F. El Ouardi**[3], **A. Lahbas**[3,4]

[1]"Horia Hulubei"−National Institute for R&D in Physics and Nuclear Engineering, RO-077125, Romania

[2]Academy of Romanian Scientists, P. O. 050094, Romania

[3]ESMaR, Department of Physics, Faculty of Science, Mohammed V University in Rabat, Rabat 10000, Morocco

[4]High Energy Physics and Astrophysics Laboratory, Department of Physics, Faculty of Science Semlalia, Cadi Ayyad University, Marrakesh 40000, Morocco

Abstract. The Bohr-Mottelson Hamiltonian [1, 2] with octic potential in the β variable has been numerically solved for $\gamma-$unstable and prolate deformations [3, 4] using as a basis the Bessel functions of the first kind [5]. The octic potential can present a single spherical or deformed minimum, a flat shape and at the same time the spherical and deformed minima, allowing in this way a description of the shape phase transitions, coexistence and mixing phenomena. Recent applications to the experimental data of the $^{98-106}$Ru and $^{106-116}$Cd even-even isotopic chains [3, 4] come to support this ability of the model.

References

[1] A. Bohr, *Mat. Fys. Medd. Dan. Vid. Selsk.* **26** (1952) 1-40.

[2] A. Bohr and B. R. Mottelson, *Mat. Fys. Medd. Dan. Vid. Selsk.* **27** (1953) 1-174.

[3] P. Buganu and R. Budaca, *Nucl. Phys. A* **1067** (2026) 123311.

[4] R. Budaca, P. Buganu, F. El Ouardi and A. Lahbas, *arXiv:2603.07194v1 [nucl-th]* (2026).

[5] H. Taşeli and A. Zafer, *Int. J. Quant. Chem.* **63** (1997) 935.