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The smooth out of shape coexistence around Z=40

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The shape of nuclei is determined by a fine balance between the stabilizing effect of closed shells and the pairing and quadrupole force that tends to make them deformed. As other well known cases, located in the A = 100 mass region, as Yb, Zr or Nb for example, Sr isotopes [1] are good candidates to study the existence of this nuclear deformation, while Ru and Mo [2] isotopes are interesting to study the dissapearance of this phenomenon. In particular, in the Sr case, particle-hole excitations are favoured because of the presence of the proton subshell closure Z = 40, resulting in low-lying intruder bands.

This study will clarify the presence of low-lying intruder states in the even-even isotopes considered together with the way it connects with the onset of deformations. In order to reach this aim, the study of the nuclear structure of neutron rich even-even isotopes of Sr, Ru and Mo using the description of excitation energies, B(E2) transition rates, nuclear radii and two neutron separation energies within the framework of the Interacting Boson Model with configuration mixing is developed.

For the whole chain of isotopes analysed, good agreement between theoretical and experimental values of excitation energies, transition rates, separation energies, radii and isotope shift has been obtained. Furthermore, the wave functions, together with the obtention of mean field energy surfaces and the value of nuclear deformation have been analysed. Finally, an analysis of the existence of quantum phase transitions for Sr, Mo and Ru isotopes is included.

[1] E. Maya-Barbecho and J.E. García-Ramos, "Shape coexistence in Sr isotopes", Physical Review C 105, 034341-16p (2022).
[2] E. Maya-Barbecho, S. Baid, J.M. Arias and J.E. García-Ramos, "At the borderline of shape coexistence: Mo and Ru", to be published.

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