Shape isomers, clusterization

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Abstract

The U(3) symmetry plays an essential role in connecting the fundamental structure models of atomic nuclei not only for the single-shell problem, but also for multi-shell excitations [1]. In this talk I show how this connecting symmetry can be applied for the determination of the stable shapes of nuclei.

The method is based on the investigation of the stability and self-consistency of the SU(3) symmetry [2], having quantum numbers which uniquely determine the quadrupole shape. The calculation is carried out in terms of the Nilsson model and the quasi-dynamical symmetry. This approach is an alternative of the well-known energy-minimum calculation for finding the shape isomers.

Due to the presence of the U(3) symmetry a selection rule for the cluster configurations (and consequently for the reaction channels) can be used.

Applications to light [2], as well as to heavy nuclei [3, 4], will be presented. (Heavy nuclei also have quasi-dynamical U(3) symmetry.)

Some of our theoretical predictions on shape isomers have already been approved by experimental observations [5, 6].

References

[1] J. Cseh, G. Riczu, J. Darai, SSNET 2022 Conference, Orsay contribution, will be submitted in November 2022
[2] J. Cseh, G. Riczu, J. Darai, Phys. Lett. B 795 (2019) 160.
[3] J. Darai et. al,, Phys. Rev. C84 (2011) 024302.
[4] A. Algora, J. Cseh, J. Darai, P. O. Hess, Phys. Lett. B639 (2006) 451.
[5] D.G. Jenkins et. al, Phys. Rev. C 86 (2012) 064309;
J. Darai, J. Cseh, D.G. Jenkins, Phys. Rev. C 86 (2012) 064309.
[6] W. Sciani et. al, Phys. Rev. C80 (2009) 034319;
J. Cseh, J. Darai et. al, Phys. Rev. C80 (2009) 034320.