Contribution ID: **25** Type: **not specified**

Role of pair-vibrational correlations in forming the odd-even mass difference

Tuesday, 4 September 2018 17:40 (20 minutes)

The RPA-amended Nilsson-Strutinskij theory, which successfully describes the pattern of binding energies of nuclei with approximately equal neutron number N and proton number Z and the energy differences between the lowest state with isospins T = 0 and 1, respectively, in the doubly odd N = Z nuclei [1,2], is applied to the Sn isotopic chain. In this theory, a pair-vibrational correlation energy calculated in the random phase approximation (RPA) is added to the independent-nucleon and Bardeen-Cooper-Schrieffer pairing energy terms of the Nilsson-Strutinskij theory. The pair-vibrational correlations are found to contribute about 10% of the total odd-even mass difference as the result of the blocking of the level of the unpaired nucleon to the pairing interaction. Evidence is given suggesting that this percentage is larger in lighter nuclei. The neutron-proton pair-vibrational correlation energy, which equals the neutron and proton ones in systems with equally many neutrons and protons and identical single-neutron and single-proton spectra, is found to remain large at the T = 16 of 132Sn. Reproducing the pattern of binding energies of the Sn isotopes around N = 82 requires an appreciable reduction with increasing T of the pair coupling constant as given by the (N+Z)-dependent expression emerging from the study of the N ~ Z region. The present study demonstrates that the RPA-amended Nilsson-Strutinskij theory is able of encompassing nuclei with N ~ Z and such with a large neutron excess by a unified description whose input consists of the stationary energy levels in a, possibly deformed, single-nucleon potential well and an isovector pairing interaction.

[1] Bentley, Neergård, Frauendorf, Phys. Rev. C 89, 034302 (2014)
[2] Neergård, Nucl. Theor. 36, 195 (2017)

Selected session

Nuclear Structure and Dynamics

Primary author: Dr NEERGÅRD, Kai (unaffiliated)

Presenter: Dr NEERGÅRD, Kai (unaffiliated)

Session Classification: Nuclear Structure and Dynamics (SALONE BOLOGNINI)