Analogies in the structure of exotic nuclei with N≈50 and N≈82

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Two main mechanisms are predicted to drive the possible shell evolution phenomena: the first is the so called monopole migration [1], which acts for both proton and neutron-rich nuclei, and the second, shell quenching, which is due to a softening of the potential shape that results from the presence of an excessive number of neutrons in very neutron-rich nuclei [2]. These mechanisms modify the known magic numbers as a consequence of shifting effective single-particle levels when going towards either the proton or the neutron drip lines. In medium-heavy nuclei the effort to establish shell evolution concentrates around the ^{100}Sn [3] and ^{132}Sn [4,5] doubly magic nuclei. The Sn isotopes form the longest isotopic chain in the nuclear chart accessible to current experimental study and thus provide a stringent testing ground for nuclear structure models. A remarkable similarity was found between the decay of 8^+ isomers in ^{98}Cd$_{50}$ [6] and ^{130}Cd$_{82}$ [5], both of which have a pure $g_{9/2}^{-2}$ proton-hole configuration. However, the analogue of the known core excited isomer in ^{98}Cd [7] was not observed in ^{130}Cd, within experimental sensitivity, thus underlining the differences in the underlying neutron single-particle structure. The understanding of analogies in the structure of both regions of nuclei and the evolution of the N=82 shell gap below ^{132}Sn is of importance in predicting the path of the rapid-neutron capture process which partially drives the production of elements heavier than Fe in nature. A handful of additional information on these two regions of nuclei was obtained recently in spectroscopy studies within the Rare ISotopes INvestigation at GSI (RISING) project [8,9] including the rp-process waiting point nuclei. Selected results will be discussed and compared with large scale shell model calculations using various sets of the realistic residual two-body interaction.

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