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Recent results on level structures and lifetimes in 130Cd and 98Cd and their analogies

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The search for the mechanisms to drive the possible shell evolution phenomena is ongoing. Originally and up to date, two mechanisms are considered. The first one, is the so called monopole migration [1], which acts for both proton and neutron-rich nuclei, and the second one, the shell quenching 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 100Sn and 132Sn 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 within a large isospin span. A remarkable similarity was found between the decay of 8+ isomers in 98Cd50 [3] and 130Cd82 [4], both of which have a pure g9/2-2 proton-hole configuration. However, the analogue of the known core excited isomer in 98Cd [5] was not observed so far in 130Cd, 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 132Sn 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 and for those two particular nuclei was obtained recently in spectroscopy studies [6,7], and newly, evaluating experimental information collected in various experimental campaigns including EURICA [8], HiCARI [9], and DESPEC [10] in yet unpublished data subsets. The most recent results include identification of new 2-hole level structures, and most importantly, the lifetime information for most of the levels in both nuclei, even if not all with high precision. The 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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