HIGH-SPIN SHELL-MODEL STATES IN NEUTRON-RICH SN ISOTOPES

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The seniority v = 2 and 3 $(h_{11/2})^n$ 10^+ and $27/2^-$ isomers known in all neutron-rich Sn isotopes were established in a series of deep-inelastic heavy ion reactions [e.g. 1-3]. The *B(E2)* values extracted for isomeric transitions reflected in a rather striking way the filling of the $h_{11/2}$ neutron orbital and indicated that the shell is half-filled in the ^{123}Sn isotope. In an extensive analysis, we have now identified higher seniority excitations located above these isomers in the Sn isotopes extending from ^{118}Sn to the recently identified structure in ^{128}Sn.

All of the studied isotopes were produced in fusion-fission reactions with 6.9-MeV/*A* ^{48}Ca beams on ^{208}Pb and ^{238}U targets and in fission of a ^{238}U target induced by 6.7-MeV/*A* ^{64}Ni beams. Level schemes up to excitation energies in excess of 8 MeV have been established based on multi-fold gamma-ray coincidence relationships measured with the Gammasphere array. By exploiting delayed- and cross-coincidence techniques [4], extensive level schemes have been delineated. In the even Sn isotopes [5] they are dominated by seniority v = 4 and 6 excitations including the new identified 15^- and 13^- isomeric states. Their decays through parallel pathways toward the lower-lying 10^+ and 7^- isomers enabled the assignment of unique spin-parity values to nearly all of the observed seniority v = 4 states. To some of the higher-lying, seniority v = 6 levels, spin-parity values could be tentatively assigned as well. In the case of odd $^{119\text{-}125}$Sn isotopes particular attention was paid to the occurrence of $19/2^+$ and $23/2^+$ isomeric states for which the available information has now been significantly extended [6]. Also structures located above seniority v = 3 isomers with v = 5 and 7 were identified [7].

Shell-model calculations were carried out down to ^{122}Sn in the $g_{7/2}$, $d_{5/2}$, $d_{3/2}$, $s_{1/2}$, and $h_{11/2}$ model space of neutron holes with respect to a ^{132}Sn core. The results reproduce the experimental level energies and spin-parity assignments rather well. The intrinsic structure of the states is discussed on the basis of the calculated wave functions which, in many instances, point to complex configurations. In a few cases, the proposed assignments lead to unresolved issues.

The systematics of the level energies throughout the isotopic chain of the studied neutron-rich Sn isotopes displays a regular dependence with mass and this smooth behavior adds further confidence in the experimental results. Even more striking is the regularity observed in the variation of the reduced transition probabilities extracted from the measured isomeric half-lives for a number of *E2* transitions observed in the decays of the new 15^- and 13^- isomers in the even Sn isotopes as well as $23/2^+$ and $19/2^+$ in the odd ones. For these *E2* transitions, the extracted *B(E2)* probabilities have similar values and follow rather precisely the *A* dependence established earlier for the $(h_{11/2})^n$, seniority v = 2,3 isomers in the full range of $^{116-130}$Sn.

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