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TWO-PHONON STRUCTURES FOR β-DELAYED γ-SPECTROSCOPY

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The β-decay properties are very important for understanding the nuclear structure evolution at extreme N/Z ratios, for analysis of radioactive ion-beam experiments, and modeling of the astrophysical r-process. For this reason, the β-decay properties of r-process "waiting-point nuclei"^{129}Ag, ^{130}Cd, and ^{131}In provides valuable information, with important tests of theoretical calculations. One of the successful tools for nuclear structure studies is the quasiparticle random phase approximation (QRPA) with the self-consistent mean-field derived from the Skyrme interaction. The framework allows to relate the properties of the ground states and excited states through the same energy density functional. On the other hand, it would be desirable to overcome the discrepancies between the theoretical predictions low-energy 1^+ spectrum using the one-phonon QRPA wave functions of the daughter nucleus and the measurements [1]. We have generalized the approach to the coupling between one- and two-phonon terms in the 1^+ wave functions and the tensor force effects on the β-decay rates of neutron-rich nuclei [2]. We applied the influence of the phonon-phonon coupling on the multi-neutron emission probabilities [3]. The new calculation is extended by enlarging the variational space for the 1^+ states with the inclusion of the two-phonon configurations. The dominant contribution to the additional 1^+ states comes from the $[3^+ \otimes 2^+]_{QRPA}$ two-phonon configurations constructed from the charge-exchange 3^+ phonons. A correlation is found between the low-lying E2 transition strengths of the parent and daughter isobaric companions. Using the same set of parameters this correlation is studied for ^{126,128,130}In and ^{126,128,130}Cd.

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