Frontiers in Gamma Ray Spectroscopy FIG18

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Isomers from multi-nucleon hole configurations near doubly-magic 208Pb

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Content :

Nuclei with Z < 82 and multiple nucleons in hole states with respect to the heaviest doubly-magic nucleus 208Pb are near-spherical, and have high-j valence orbitals: neutron i13/2 and proton h11/2, present near the respective Fermi surfaces. These are suitable conditions for the realization of high-spin isomers with configurations having dominant contributions from high-j orbitals. Several isomers have been identified in the isotopes 201-203Tl with half-lives in the nanoseconds-microseconds range. Excited states in Tl isotopes were populated through fusion-evaporation and multi-nucleon transfer reactions. Gamma-ray coincidence data, recorded using the INGA and Gammasphere detector arrays at the Inter-University Accelerator Centre and Argonne National Laboratory, respectively, were used to establish detailed decay schemes and half-lives of isomers. Many new gamma rays have been identified in each of these isotopes. In addition to isomers, multi-quasiparticle states involving two to seven nucleons have been established in various Tl isotopes along with core excitation of possible octupole character. These data provide an opportunity to understand nuclear structure in the vicinity of 208Pb and allow for stringent tests of modern-day, large-scale shell model calculations and associated interactions.

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