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Shape Coexistence in the Proton-Unbound Nucleus ^{177}Au

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Excited states of the proton-unbound nucleus ^{177}Au have been populated following the $^{92}\text{Mo}(^{88}\text{Sr}, 2pn)$ reaction in an experiment performed at the University of Jyväskylä Accelerator Laboratory. Gamma rays detected in the JUROGAM spectrometer were correlated with the characteristic α decays of ^{177}Au detected following a recoil implantation in the GREAT spectrometer. A large number of transitions (~ 60 γ rays) have been assigned unambiguously to ^{177}Au and ordered into four collective band structures and other single-particle excitations.

Several intruder configurations formed by single-proton excitations across the $Z = 82$ shell gap have been established. These have been interpreted as $\pi i_{13/2}$, $\pi f_{7/2} \oplus h_{9/2}$ and $\pi h_{9/2}$ prolate configurations. It has been established that the $\pi i_{13/2}$ and $\pi f_{7/2} \oplus h_{9/2}$ bands have decay paths to both the positive-parity mixed ($1/2^+ \oplus 3/2^+$) ground state and the negative-parity $11/2^-$ isomer, which is unusual in this mass region. Structures based on the coupling of the odd $\pi h_{11/2}^{-1}$ proton hole to excitations of the ^{178}Hg core have been established in the excitation level scheme. An oblate $\pi h_{11/2}^{-1} \otimes ^{178}\text{Hg}(2_1^+)$ state and a prolate strongly coupled band based on the $\pi h_{11/2}^{-1} \otimes ^{178}\text{Hg}(0_2^+)$ configuration have been identified. The decay paths from the strongly coupled band and the search for evidence of electric monopole decays are discussed.

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