Abstract

High spin states in ^{182}W were studied using the deep-inelastic reaction between 840 MeV ^{136}Xe beam on thick ^{186}W target, and coincidence γ-ray techniques. Using, events recorded in between beam pulses (out-of-beam data), the known structure in ^{182}W has been observed up to the 19^+ state of the known $K^\pi = 16^+$ rotational band. New level scheme feeding this known structure has been identified, and several intrinsic states have been observed up to the 6549 keV state, which was found to be isomeric with a lifetime of 148(9) ns. Spin and parity of the new states were derived from the multipolarities of the newly observed transitions through internal conversion coefficient measurements, and angular correlations and mixing ratios. While limited spectroscopic information made it difficult to assign spin and parities for some few new observed states, spins and parities for majority of the states have been firmly identified, including the τ = 148(9) ns, 6549 keV state, which was assigned to be $K^\pi = 24^-$.

No new rotational bands have been observed in the current work, hence all new states have been found to be intrinsic. Configuration assignment to these states have been made based on the comparison of their excitation energies to the energies of configuration states reproduced in multi-quasiparticle calculations. Five six-quasiparticle states have been identified with the following configurations proposed 20^+, $\pi\{5/2^+[402], 7/2^+[404]\} \otimes \nu\{1/2^-[510], 7/2^-[514], 9/2^+[624], 11/2^+[615]\}$, 21^-, $\pi\{5/2^+[402], 9/2^-[514]\} \otimes \nu\{1/2^-[510], 7/2^-[514], 9/2^+[624], 11/2^+[615]\}$, 22^-, $\pi\{5/2^+[402], 9/2^-[514]\} \otimes \nu\{3/2^-[512], 7/2^-[514], 9/2^+[624], 11/2^+[615]\}$, 23^+, $\pi\{5/2^+[402], 7/2^+[404]\} \otimes \nu\{7/2^-[503], 7/2^-[514], 9/2^+[624], 11/2^+[615]\}$, 24^-, $\pi\{5/2^+[402], 9/2^-[514]\} \otimes \nu\{7/2^-[503], 7/2^-[514], 9/2^+[624], 11/2^+[615]\}$. Transition strengths of the new transitions are compared to those of neighboring nuclei in the A $\approx$ 180 region and majority of the values were found to be consistent with those of nuclei studied in this mass region.

For states above $K^{\pi} = 17^{-}$, low intensities in some of the depopulating transitions presented a challenge in characterizing the nature of these transitions hence the spins and parities of some states could not be confirmed. Also, as a result of the limited spectroscopic information, the nature of the $K^{\pi} = 24^{-}$ state could not be firmly confirmed. But it was suggested that its longer lifetime could be due to configuration change as opposed to K-forbiddeness of the depopulating transition since all these transitions are K-allowed. The other isomeric state at $K^{\pi} = 20^{+}$ was found to be K-isomeric on the basis of the reduced hindrance values for depopulating transitions that fall within the range for K-hindered transitions.

Generally, high level-density of intrinsic states with no rotational bands have been observed in the current work, and this is consistent with the observations in previous studies in other nuclei in this mass region as previously studied by the Australian National University research group and its collaborators. The multi-quasiparticle calculations also predicted other several intrinsic states which were not observed in the current work, consistent with this observation.