Triaxiality and the changing nature of K-isomers in tungsten nuclei from A=182 to A=190

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While deformed nuclei in the A≈180 region are well known to exhibit isomers whose long lifetimes are caused by the fact that the only available isomeric decay transitions violate K-conservation [1], the possible limits to the existence of K-isomers in neutron-rich nuclei are not well defined. Isomers have been observed in some neutron-rich cases using methods such as deep-inelastic reactions [2], relativistic fragmentation [3] and direct mass measurement [4]. Of these, the latter two methods can access more neutron-rich nuclei, but the level schemes that are obtained are generally of limited extent compared to those obtained using deep-inelastic reactions.

We have pursued a program of measurements using deep-inelastic reactions between beams of about 6 MeV/nucleon ^{136}Xe ions incident on a range of the most neutron-rich, stable, rare-earth targets. These studies have been performed at Argonne National Laboratory and used Gammasphere to observe the gamma rays emitted from weakly populated neutron-rich nuclei in the presence of an intense background of more strongly populated nuclei closer to stability. The experiments have successfully probed the structure of K-isomers in regions that were previously inaccessible and have resulted in detailed level schemes for nuclei up to 4 neutrons past stability.

Our published results for ^{190}W clarified the conflicting observations of a long-lived state and showed that the isomer was due to a low-energy M2 transition that was in fact K-allowed [5]. However, other isomers observed in ^{186}W, ^{188}W and ^{190}W seem to show a decreasing trend in K-hindrance with increasing neutron number, possibly associated with increasing triaxiality [5]. In this contribution we will present new level schemes for ^{182}W, ^{184}W, ^{185}W, ^{186}W and ^{187}W that further illuminate these trends in K-hindrance. The results include the first high-spin level schemes for ^{185}W and ^{187}W, as well as greatly expanded decay schemes for isomers observed previously in ^{184}W [6] and ^{186}W [7], including spin, parity and configuration assignments. The lifetime of the high-spin isomer in ^{186}W was previously only known to be greater than one millisecond [7], but has now been shown to be 2.9 s. The implications for predictions of very long-lived states in the neutron-rich A≈190 region will be discussed. *Research supported by the Australian Research Council as well as the DOE Office of Nuclear Physics under Contract No. DE-AC02-06CH11357.*

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