

High Spin States Populated via Projectile Fragmentation in Very Neutron-Rich Nuclei Around Mass 180

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K-isomers can be found mainly in the $A \sim 180$ region. The best examples of K-isomerism are predicted to occur on the neutron-rich side of the valley of stability and are thus barely reachable by standard nuclear reactions like deep inelastic reactions. Up to now, only projectile fragmentation has proven to be an efficient method in populating heavy neutron-rich isotopes with cross-sections sufficient to perform γ -ray spectroscopy. Thus, the FRagment Separator [1] (FRS) associated with γ -ray spectroscopy techniques has been successfully used at GSI to search for K-isomers with lifetimes ranging from nano- to milliseconds in the mass region around $A \sim 180$.

These isomers were produced following the fragmentation of a 1 GeV/nucleon ^{208}Pb beam impinging on a 1.6 g/cm² Be target. The fragments were separated through the FRS working in achromatic mode and identified using the $B\rho$ - ΔE -TOF method. Ions were stopped in a 5 mm thick Al catcher covering an implantation area of 16 cm on horizontal position. Prompt and delayed γ -rays in coincidence with implanted ions of interest were measured using a Segmented Clover Array whose efficiency was about 6% at 1.33 MeV for the central position of the catcher.

Several new isomers were observed in neutron-rich $A=180$ -200 nuclei, as shown in the following figure, providing the first nuclear structure information from the successive γ -decay cascade. In particular, the rotational band of ^{190}W [2] has been observed for the first time.

Moreover, the ability of this novel method to reach high spin states has been demonstrated by populating $K=\frac{35}{2}^-$ isomeric state in ^{175}Hf [3], ^{179}W [4] and ^{181}Re [5]. This spin represents the highest value observed so far in projectile fragmentation.

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