

Photo-Induced Population of the $h_{11/2}$ Isomeric States in (γ,n) Reactions

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The mechanism of excitation of isomeric $h_{11/2}$ states in nuclei around the closed shell at $N=82$ have been studied at the High-Intensity Gamma Source (HIGS). We have taken advantage of the monoenergetic ($\Delta E/E=1.5\%$) and pulsed γ -ray-beam from HIGS to perform in-beam spectroscopy measurements with a new level of precision and sensitivity. The giant dipole resonances at 15 MeV in the target nuclei ^{138}Ba , ^{140}Ce , and ^{142}Nd have been excited and following neutron emission the γ -ray cascades leading to the isomeric $h_{11/2}$ state and the ground state were observed in these nuclei. Four 60% HPGe detectors were utilized perpendicular to the beam axes to measure the γ -ray cascades in the residual nuclei. For all three nuclei very similar de-excitation scheme was found. The only level observed from which the isomeric state was populated was found to be $J^\pi=7/2^-$. The ground state is principally populated from the states with spin and parities $J^\pi=1/2^+$, $3/2^+$, and $5/2^+$. The structure of the $N=81$ isotones and the role of the gateway states in isomer population will be discussed¹. The results of the measurements will be compared with statistical model.

¹N. Tsoneva, et al. Phys. Rev. C **61**, 044303 (2000).