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Gamma-ray measurement for isomeric decays in proton-rich pf-shell nuclei at SHARAQ spectrometer

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The mass measurement of proton-rich unstable nuclei in the vicinity of 47Fe has been performed utilizing the TOF-Bρ method with BigRIPS and OEDO-SHARAQ spectrometer at RIBF. In this measurement, the secondary beam included several nuclei with isomeric states in the pf-shell region. The isomer tagging provides us exact particle identification (PID) like a unique fingerprint. Moreover, the isomeric ratio is essential for the precision of the masses of the isotopes with isomeric states. Our porposes are the discovery of new isomers in this region, the determination of unknown lifetimes and energies, and improvement of their precision.

The gamma-ray detection system which consists of two HPGe detectors, two CeBr3 detectors and an active stopper composed of two 10-mm-thick plastic scintillators was installed downstream of the final focal plane (S2) in the air. The active stopper was placed in the center of the detector arranged. The two HPGe detectors were installed perpendicular to the beam direction, while CeBr3 detectors were tilted at a 45-degee angle. A 20-mm-thick aluminum degrader was installed to adjust the stopping range. Additionally, a veto scintillator was placed downstream of the active stopper to eliminate the possibility of nuclides penetrating it. These energy and timestamp information about the gamma-ray signals were recorded using digital signal processers. Currently, the known isomers, such as 38mK, 43mSc, 46mSc, 43mTi, and 46mV, have been analyzed. In this presentation, we will discuss the accuracy of the gamma-ray energies, half-lives and isomeric ratios associated with these isomers.

Presentation type

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