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Exploring Shell Structure at N=32, 34: Mass Measurements of Sc, Ti, and V Isotopes

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In this contribution, we report on mass measurements of ^{55}Sc, $^{55-58}$Ti, and $^{55-59}$V isotopes obtained during the first commissioning campaign of the ZD-MRTOF system at the RIBF/RIKEN. We discuss the implications of these masses in the shell structure at $N = 32, 34$ in the context of deformation toward $N = 40$. The newly installed experimental system, located downstream of the ZeroDegree (ZD) spectrometer at the BigRIPS facility (RIBF/RIKEN), comprises a radiofrequency (RF) carpet-type He gas cell combined with a multi-reflection time-of-flight mass spectrograph (MRTOF). In the first low-energy experiment at BigRIPS, high-energy products were captured and decelerated in helium gas, and subsequently extracted through an aperture via an RF microstructure into a Paul trap ion guide structure. The cooled and thermalized ions were injected into the MRTOF system as a high-quality beam for high-precision mass measurements. We describe the details of the new cryogenic gas cell and the mass analysis methods employed in this experiment. Additionally, we present our future plans for mass measurements, particularly in the $N = 126$ region, which is close to waiting point nuclei relevant to the third peak of the r-process.

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