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Search for element 119 in the ^{248}Cm(^{51}V,xn) reaction at RIKEN

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Following the successful synthesis of Nihonium (Nh, Z = 113), the RIKEN Nishina Center for Accelerator-Based Science (RNC) launched a new program to produce even heavier elements—specifically elements 119 and 120—using hot fusion reactions. To enable this program, RNC upgraded its superconducting linac accelerator (SRILAC) and superconducting ECR ion source, thereby increasing both the beam intensity and the maximum acceleration energy. A new gas-filled recoil ion separator, GARIS-III, was also constructed and optimized for hot fusion reactions [1]. Commissioning of these upgrades was completed in 2017, achieving ^{51}V beam energies of up to 6.5 MeV/u.

Subsequently, the nSHE collaboration was established, bringing together researchers from Japan, the USA, France, Poland, Australia, and China. Highly enriched $^{248}Cm_2O_3$ material was provided to RNC under a Material Transfer Agreement with Oak Ridge National Laboratory. Using high-intensity beams, we carried out an experiment to synthesize element 119 via the $^{51}V + {}^{248}Cm \rightarrow {}^{299-x}119 + xn$ reaction. After reaching the planned cross-section sensitivity, we have temporarily concluded this experimental campaign and are now formulating the next strategy.

In this presentation, we report on the current status of the experiment, including the experimental setup, the methodology used to determine the optimal irradiation energy, and the progress made toward the detection of element 119.

References

[1] H. Sakai, H. Haba, K. Morimoto and N. Sakamoto, Eur. Phys. J. A 58, 238 (2022).