Status of New Element Search 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, the RNC upgraded its superconducting linac accelerator (SRILAC) and superconducting ECR ion source, increasing both beam intensity and maximum acceleration energy. A new gas-filled recoil ion separator (GARIS-III) was also constructed, optimized for hot fusion reactions [1]. Commissioning of these upgrades was completed in 2019, achieving ^{51}V beam energies up to 6.5 MeV/u.

Subsequently, the nSHE collaboration was established, bringing together researchers from Japan, the USA, France, Poland, Australia, and China.

Our experiment to synthesize element 119 is currently underway, employing the $^{51}\mathrm{V} + {}^{248}\mathrm{Cm} \rightarrow {}^{299-x}119 + xn$ reaction with high-intensity beams. Highly enriched $^{248}Cm_2O_3$ material was provided to RNC under a Material Transfer Agreement with Oak Ridge National Laboratory.

In this presentation, we report on the status of the experiment, including the experimental setup, the methodology for determining the optimal irradiation energy, and our progress toward the detection of element 119.

References

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