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Excitation functions for production of rutherfordium isotopes in the 248Cm + 18O reaction

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Rutherfordium-261 (261aRf; T1/2 = 68s) has been used in chemical studies of element 104, Rf [1]. In recent years, it was reported that there exists a spontaneously-fissioning (SF) isomer (261bRf; T1/2 = 2.6 s) in 261Rf [2-6]. On the other hand, a SF isomer with the similar half-life of 2.1 s also had been reported as 262Rf (T1/2 = 47 ms) [7,8]. It is possible that these two SF isomers are the same and one of these is misassigned. In this work, the excitation functions of Rf isotopes in the 248Cm + 18O reaction were measured to clarify the ambiguity on the assignment of the fissioning isomers in 261,262Rf [9]. Rutherfordium isotopes were produced by bombarding the 248Cm target with an 18O beam supplied from the RIKEN linear accelerator. The beam energies were 88.2, 90.2, 94.8, and 101.3 MeV at the center of the target. A gas-filled recoil ion separator (GARIS) was used to separate the evaporation residues (ERs) in-flight from the incident particles and majority of by-products. ERs were then implanted into a position-sensitive Si strip detector mounted at the focal plane of GARIS. The beam on-off method was applied to measure the decay events of Rf isotopes under low background conditions. At each beam energy, beam on-off periods were set to 6 s-6 s and 0.1 s-0.1 s. The shape of the measured excitation function of 261aRf agreed with the previously reported one [10]. The excitation function of a-few-second SF nuclide exhibited the maximum cross section at 94.8MeV, and the shape of the excitation function was almost the same as that of 261aRf. On the other hand, short-lived SF decays were observed at 88.2 MeV and 101.3 MeV, and they were assigned to 262Rf and 260Rf, respectively. Such the short-lived SF decay was not observed at 94.8MeV. Therefore, we concluded that a-few-second SF nuclide previously assigned to both 261bRf and 262Rf is not 262Rf but 261bRf.

References

[1] M. Schädel, Angew. Chem. Int. Ed. 45, 368 (2006).
[2] S. Hofmann et al., Eur. Phys. J. A 14, 147 (2002).
[3] J. Dvorak et al., Phys. Rev. Lett. 97, 242501 (2006).
[4] J. Dvorak et al., Phys. Rev. Lett. 100, 132503 (2008).
[5] H. Haba et al., Phys. Rev. C 83, 034602 (2011).
[6] H. Haba et al., Phys. Rev. C 85, 024611 (2012).
[7] L. P. Somerville et al., Phys. Rev. C 31, 1801 (1985).
[8] M. R. Lane et al., Phys. Rev. C 53, 2893 (1996).
[9] M. Murakami et al., Phys. Rev. C 88, 024618 (2013).
[10] Y. Nagame et al., J. Nucl. Radiochem. Sci. 3, 85 (2002).

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