

12th International Conference on Chemistry Meeting

October 20-21, 2022 | Webinar

Volume: 13

Synthesis and chemistry of new elements at RIKEN

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Since the official approval of four new heavy elements with atomic number $Z = 113, 115, 117,$ and 118 by IUPAC in 2016, the 7th period of the periodic table of the elements has been complete. Element 113 was synthesized in the fusion reaction of ^{70}Zn ($Z = 30$) on ^{209}Bi ($Z = 83$) using the Gas-filled Recoil Ion Separator (GARIS) at the RIKEN linear accelerator facility. The name “nihonium” and symbol “Nh” were given for the new element, the first discovered in Asian countries. An attempt to create element 119 is under way through the ^{248}Cm ($Z = 96$) + ^{51}V ($Z = 23$) reaction. To study chemical properties of the new elements, we have been developing a novel chemistry setup using GARIS. This system is promising for exploring new frontiers in the superheavy element chemistry. Background radiations from unwanted byproducts are suppressed, high production yields are achieved and new chemical reactions can be investigated. Long-lived isotopes of ^{261}Rf ($Z = 104$), ^{262}Db ($Z = 105$), ^{265}Sg ($Z = 106$) and ^{266}Bh ($Z = 107$) useful for chemistry studies were produced in the heavy-ion induced reactions on the ^{248}Cm target and their decay properties were investigated in detail. Present status and perspectives of the superheavy element chemistry at RIKEN are also presented.

Biography

Hiromitsu Haba received his PhD from Kanazawa University in 1999. In the following years, he worked at Japan Atomic Energy Institute as Postdoctoral Researcher (1999–2001) and at RIKEN as Special Postdoctoral Researcher (2002–2004), Research Scientist (2004–2006), Senior Research Scientist (2007–2010) and Team Leader (2011–2017). Since 2018, he has been Group Director of RI Application Research Group, Nishina Center for Accelerator-Based Science, RIKEN. In 2001, he was awarded the “Young Scientist Award” of the The Japan Society of Nuclear and Radiochemical Sciences. His scientific interests are nuclear and radiochemistry in general, with one focus on the synthesis and chemistry of superheavy elements.

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