

Fee-based activities performed by Nuclear Chemistry Group

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This article summarizes the fee-based activities performed by the Nuclear Chemistry Group in 2024 including the distribution of radioisotopes (RIs) and utilization of heavy-ion beams in the industry.

Since 2007, RIKEN in collaboration with the Japan Radioisotope Association¹⁾ (JRIA) has distributed RIs to users in Japan for a fee. The nuclides include ^{65}Zn ($T_{1/2} = 244$ d), ^{109}Cd ($T_{1/2} = 463$ d), ^{88}Y ($T_{1/2} = 107$ d), ^{85}Sr ($T_{1/2} = 65$ d), and ^{67}Cu ($T_{1/2} = 61.8$ h) produced with the RIKEN AVF cyclotron by the Nuclear Chemistry Group. In 2024, we started distributing the new product, ^{139}Ce ($T_{1/2} = 138$ d). According to a material transfer agreement (MTA) between JRIA and RIKEN, JRIA mediates the transaction of RIs and distributes them to users. ^{65}Zn and ^{109}Cd are delivered approximately two weeks after an order is accepted. ^{67}Cu , ^{85}Sr , ^{88}Y , and ^{139}Ce , which have short half-lives, are not stocked like the others; instead, they are produced in a scheduled beamtime after an order is accepted. Therefore, they are delivered after two or more months. Details related to RIKEN RIs can be found on the online ordering system, J-RAM,²⁾ of JRIA.

In 2024, we delivered 4 MBq of ^{109}Cd in two shipments, 33.1 MBq of ^{65}Zn in eight shipments, and 17.4 MBq of ^{85}Sr in three shipments. No orders were received for ^{67}Cu , ^{88}Y , and ^{139}Ce . The final recipients of the RIs included eight universities, one research institute, and one private company. Figure 1 shows the yearly trends of the number of orders and the radioactivity of the distributed RIs. The number of orders and the radioactivity of the distributed ^{65}Zn increased to the highest in the last ten years.

In addition, we provide ^{211}At ($T_{1/2} = 7.2$ hours) through the MTA drawn between Osaka University and RIKEN. ^{211}At is delivered to the university directly from RIKEN because of its short half-life. In 2024, we delivered 7.1 GBq of ^{211}At in 15 shipments.

The Industrial Application Research Team of the Nuclear Chemistry Group promotes the utilization of heavy-ion beams in the industry. The RIKEN Nishina Center allows the use of the AVF cyclotron, RILAC2, and RIKEN Ring Cyclotron (RRC) by private companies in Japan for a fee.³⁾ Currently, the main users include semiconductor companies that irradiate space-use semiconductor devices with ^{40}Ar , ^{84}Kr , or ^{129}Xe ions from the RRC to simulate single-event effects caused by the heavy-ion components of cosmic radiation.

The proposals for beam utilization are reviewed by a program advisory committee dedicated to industrial

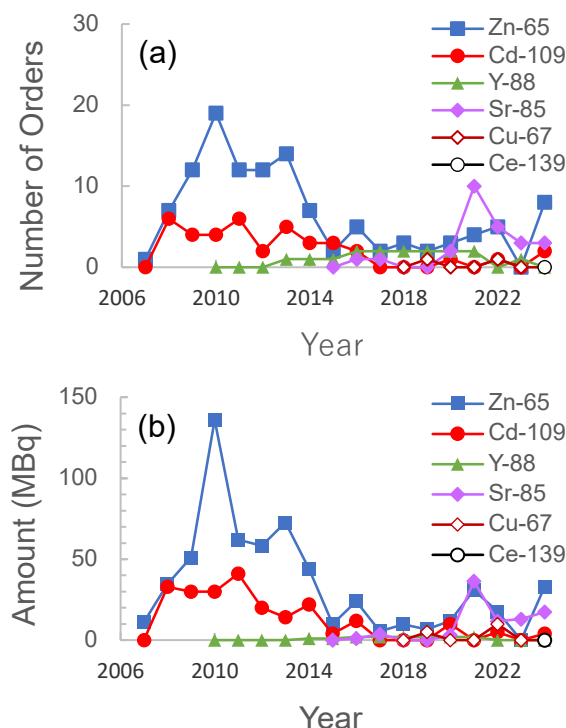


Fig. 1. Number of orders (a) and radioactivity (b) of RIs distributed annually, 2007–2024. Distributions of ^{88}Y , ^{85}Sr , ^{67}Cu , and ^{139}Ce started in 2010, 2015, 2018, and 2024, respectively.

use (In-PAC).

In January 2024, In-PAC held its 22nd meeting where it reviewed and approved nine proposals, including two new proposals. In June 2024, In-PAC held its 23rd meeting, where it reviewed and approved ten proposals, including three new proposals.

In 2024, six companies executed 39 fee-based beam-times: 23 used a ^{84}Kr beam, 14 utilized an ^{40}Ar beam, and 2 utilized a ^{129}Xe beam, with total beam times of 270, 142, and 21 hours, respectively.

References

- 1) <https://www.jrias.or.jp/> (Japanese), <https://www.jrias.or.jp/e/> (English).
- 2) <https://j-ram.org/> (Japanese).
- 3) <https://ribf.riken.jp/sisetu-kyoyo/HIbeam/> (Japanese).

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