

Fee-based activities performed by the RI application research group

A. Nambu,^{*1} H. Haba,^{*1} A. Yoshida,^{*1} K. Watanabe,^{*1} and T. Kambara^{*1}

This article summarizes the fee-based activities performed by the RI Application Research Group in 2022, which include the distribution of radioisotopes (RIs) and utilization of heavy-ion beams in the industry.

Since 2007, RIKEN has distributed RIs to users in Japan for a fee in collaboration with the Japan Radioisotope Association¹⁾ (JRIA). 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 in the RIKEN AVF cyclotron by the Nuclear Chemistry Research Team of the RI Application Research Group.

According to a material transfer agreement (MTA) drawn 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 the acceptance of an order. ^{85}Sr , ^{88}Y , and ^{67}Cu , which have short half-lives, are not stocked like ^{65}Zn and ^{109}Cd ; instead, they are produced in a scheduled beamtime after an order is accepted. Therefore, they are delivered after two or more months. Details regarding RIKEN RIs can be found on the online ordering system, J-RAM,²⁾ of JRIA. In 2022, we delivered 5, 1, 5, and 1 shipments of ^{65}Zn , ^{109}Cd , ^{85}Sr , and ^{67}Cu with a total activity of 17.7, 5, 11.7, and 10 MBq, respectively; there was no shipment of ^{88}Y . The ^{67}Cu delivery was the second since the beginning of its distribution in 2018. The final recipients of RIs included six universities, one research institute, and two private companies. Figure 1 shows the yearly trends in the number of orders and amount of distributed RIs. Compared with 2021, the amounts of distributed ^{109}Cd and ^{67}Cu increased, and those of ^{65}Zn , ^{88}Y , and ^{85}Sr decreased. The amount of ^{85}Sr distributed in 2022 was still the second highest since the beginning of its distribution. The number of orders for ^{65}Zn in 2022 increased again and reached its highest in the last eight years.

In addition, we also provide ^{211}At ($T_{1/2} = 7.2$ h) through an MTA drawn between Osaka University and RIKEN, and among University of Tokyo, Saitama Medical University, and RIKEN. ^{211}At is delivered to the universities directly from RIKEN due to its short half-life. In 2022, we delivered a total of 5.4 GBq of ^{211}At to Osaka University in 11 shipments, and 250 MBq to University of Tokyo in 5 shipments.

The Industrial Application Research Team of the RI Application Research 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-

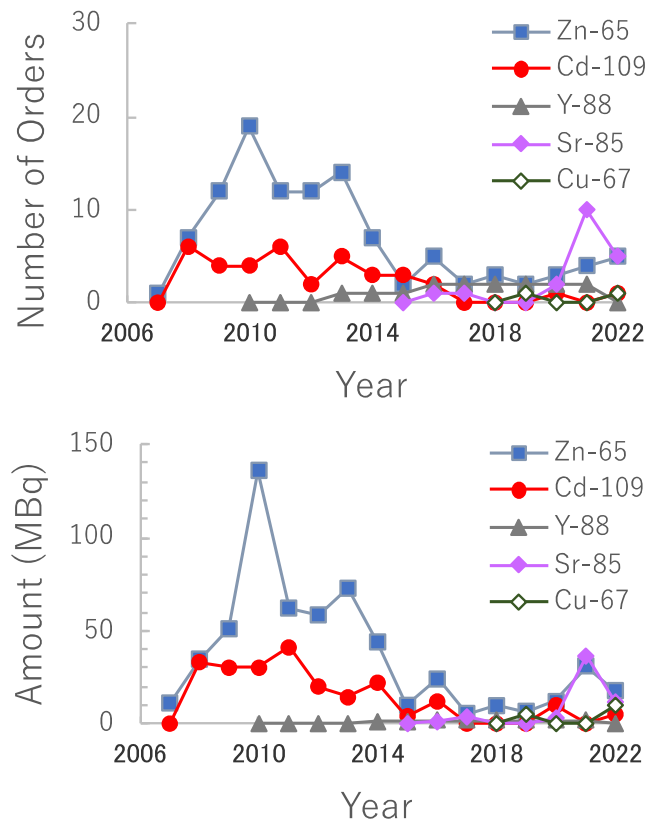


Fig. 1. Number of orders (upper) and amount (lower) of RIs distributed annually from 2007 to 2022. The distribution of ^{88}Y , ^{85}Sr , and ^{67}Cu started in 2010, 2015, and 2018, respectively.

use semiconductor devices with ^{40}Ar , ^{84}Kr , or ^{136}Xe ions from the RRC to simulate single-event effects due to the heavy-ion components of cosmic radiation.

The proposals for beam utilization are reviewed by a program advisory committee dedicated to industrial use (In-PAC).

In January 2022, In-PAC reviewed and approved two proposals via e-mail. In July, In-PAC held its 19th meeting, where it reviewed and approved seven proposals, including four new proposals.

In 2022, seven companies executed 25 fee-based beamtimes, 14 of which used a ^{84}Kr beam with a total beamtime of 234 hours, 9 utilized an ^{40}Ar beam with a total beamtime of 129 hours, and 2 utilized a ^{136}Xe beam with a total beam time of 20 hours.

References

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

^{*1} RIKEN Nishina Center