

Fee-based activities of the Industrial Application Research Team

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The fee-based activities of the Industrial Application Research Team in 2020, which are the utilization of heavy-ion beams in the industry and the distribution of radioisotopes, are summarized below.

RIKEN Nishina Center allows the use of the AVF cyclotron, RILAC, and RIKEN Ring Cyclotron (RRC) by private companies in Japan for a fee.¹⁾ At present, the main users are semiconductor companies that irradiate space-use semiconductor devices with Ar, Kr, and Xe ions from the RRC to simulate single-event effects due to the heavy-ion components of cosmic radiation. Proposals for beam utilization are reviewed by a program advisory committee dedicated to industrial use (InPAC). In July 2020, InPAC reviewed and approved via e-mail three proposals that were in continuation to previously approved proposals and held its 10th meeting online, where it reviewed and approved two new proposals. In 2020, six companies executed eleven fee-based beamtimes, seven of which utilized a Kr beam with a total beam time of 153 h and four utilized an Ar beam with a total beam time of 73 h. In response to the users' demand, we are preparing to supply C ions and considering the supply of Xe ions with higher energies.

Since 2007, RIKEN has distributed radioisotopes (RIs) to users in Japan for a fee in collaboration with the Japan Radioisotope Association²⁾ (JRIA). The nuclides are ^{65}Zn ($T_{1/2} = 244$ days), ^{109}Cd ($T_{1/2} = 463$ days), ^{88}Y ($T_{1/2} = 107$ days), ^{85}Sr ($T_{1/2} = 65$ days), and ^{67}Cu ($T_{1/2} = 61.8$ hours) produced at the AVF cyclotron by the Nuclear Chemistry Research Team. According to a material transfer agreement (MTA) drawn between JRIA and RIKEN, JRIA mediates the transaction of the 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 but are instead produced in a scheduled beamtime after an order is accepted. Therefore, they are delivered two months or more after an order. Details can be found in the online ordering system J-RAM³⁾ of JRIA.

In 2020, we delivered one shipment of ^{109}Cd with an activity of 10 MBq, three of ^{65}Zn with a total activity of 12 MBq, two of ^{88}Y with a total activity of 2 MBq, and two of ^{85}Sr with a total activity of 3 MBq. The final recipients of the RIs were four universities, one private company, and one medical research center.

Figure 1 shows the yearly trends in the number of orders and the amounts of distributed RIs. Compared with 2019, the amounts of distributed ^{109}Cd , ^{65}Zn , and

^{85}Sr increased, that of distributed ^{67}Cu decreased, and that of distributed ^{88}Y remained the same. During the past 10 years, the demand for long-lived RIs has drastically decreased, whereas that for short-lived RIs is increasing.

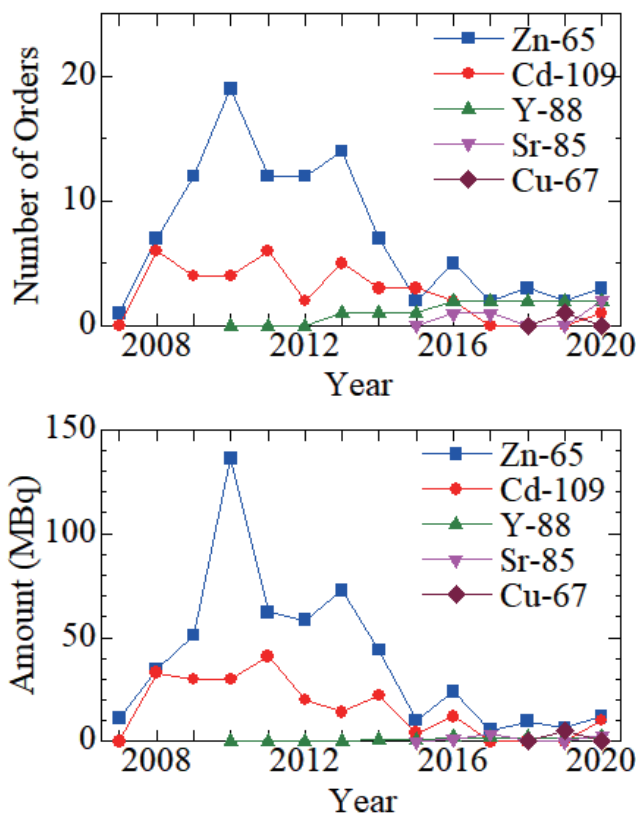


Fig. 1. Number of orders (upper) and amounts (lower) of the RIs distributed yearly from 2007 to 2020. The distribution of ^{88}Y started in 2010, that of ^{85}Sr in 2015, and that of ^{67}Cu in 2018.

References

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

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