

Present status of liquid-helium supply and recovery system

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A liquid-helium supply and recovery system,¹⁾ which can produce liquid helium at a liquefaction rate of 200 L/h from pure helium gas, has been under stable operation since the beginning of April 2001. However, due to increased operational failures caused by deterioration over time, the liquefier was duplicated in 2017. The new liquefier can produce liquid helium at a liquefaction rate of 220 L/h from pure helium gas. Although the older helium liquefier has been failing since the summer of 2018, the new helium liquefier provides a constant supply of liquid helium. The older helium liquefier was repaired in February 2020.

The volumes of liquid helium supplied each year from 2001 to 2021 are illustrated in Fig. 1. From 2001 to 2013, there was a gradual increase in the supplied volume, with two decrements in 2009 and 2011. In 2014, the supplied volume decreased owing to a system malfunction. However, in 2015, it returned to its original value. In 2016, the supplied volume decreased, whereas it increased slightly in 2017 and significantly in 2018. In 2019, approximately 140,000 L of liquid helium was supplied despite the high price of helium gas. In 2020, a supply volume decrease of approximately 15,000 L was caused by the influence of the new coronavirus.

Moreover, the purity of helium gas recovered from the laboratories has gradually deteriorated. Currently, the impurity concentration in the recovered gas is approximately 1700 ppm, which affects the liquefaction process and makes continuous operation difficult. Therefore, improving the purity of the recovered helium gas is necessary. As one of the causes, the purity of the recovered gas from gas holder E was found to be down to about 95%.

Furthermore, the volume of helium gas recovered from each building in the Wako campus as well as the volume transported to the liquid-helium supply and recovery system were measured. The recovery efficiency was calculated as the ratio of the amount of recovered helium gas to the amount of supplied liquid helium. The recovery efficiency for the buildings on the south side of the Wako campus, *i.e.*, the Cooperation Center building of the Advanced Device Laboratory, Chemistry and Material Physics building, and Nanoscience Joint Laboratory building, increased to approximately 98%.

Reference

- 1) K. Ikegami *et al.*, RIKEN Accel. Prog. Rep. **34**, 349 (2001).

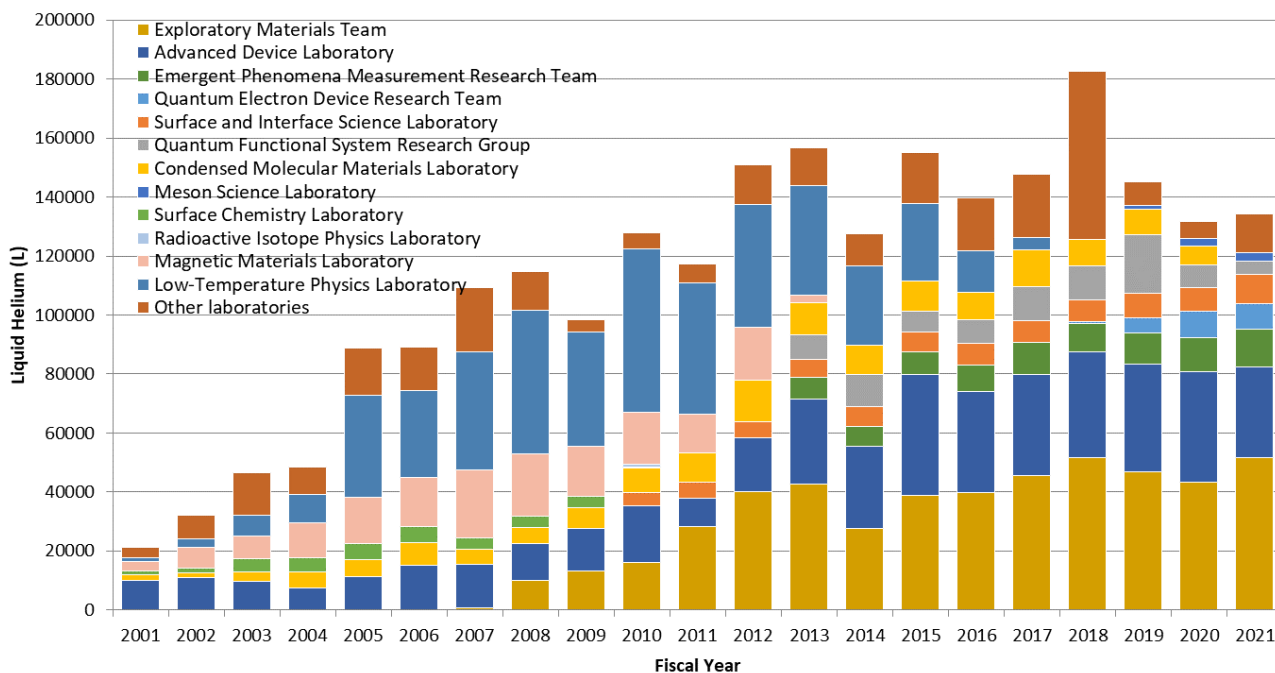


Fig. 1. Volumes of liquid helium supplied to various laboratories for each fiscal year from 2001 to 2021.

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