# Present status of liquid-helium supply and recovery system

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The 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, as operation failure due to deterioration over time has increased in recent years, duplication of the liquefier was conducted 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, with the new helium liquefier, a constant supply of liquid helium can be enabled. The older helium liquefier was repaired in February 2020.

The volumes of liquid helium supplied each year from 2001 to 2019 are illustrated in Fig. 1. From 2001 to 2013, there was a gradual increase in the supplied volume, with two declines observed in 2009 and 2011. In 2014, the supplied volume decreased owing to a system malfunction. However, in 2015, the supplied volume returned to its original value. In 2016, the supplied volume decreased but slightly increased in 2017. In 2018, the supply volume increased significantly. In 2019, we supplied approximately 140,000 L of liquid helium despite the high price of helium gas.

However, the purity of helium gas recovered from the laboratories gradually deteriorated. At present, the impurity concentration in the recovered gas is approximately 1000 ppm. The impurity concentration does not affect the liquefaction operation, but is necessary to observe the progress.

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, which is defined as the ratio of the amount of recovered helium gas to the amount of supplied liquid helium, was calculated. The recovery efficiency for the buildings on the south side of the Wako campus, namely the Cooperation Center building of the Advanced Device Laboratory, Chemistry and Material Physics building, and Nanoscience Joint Laboratory building, increased to approximately 95%.

Reference

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

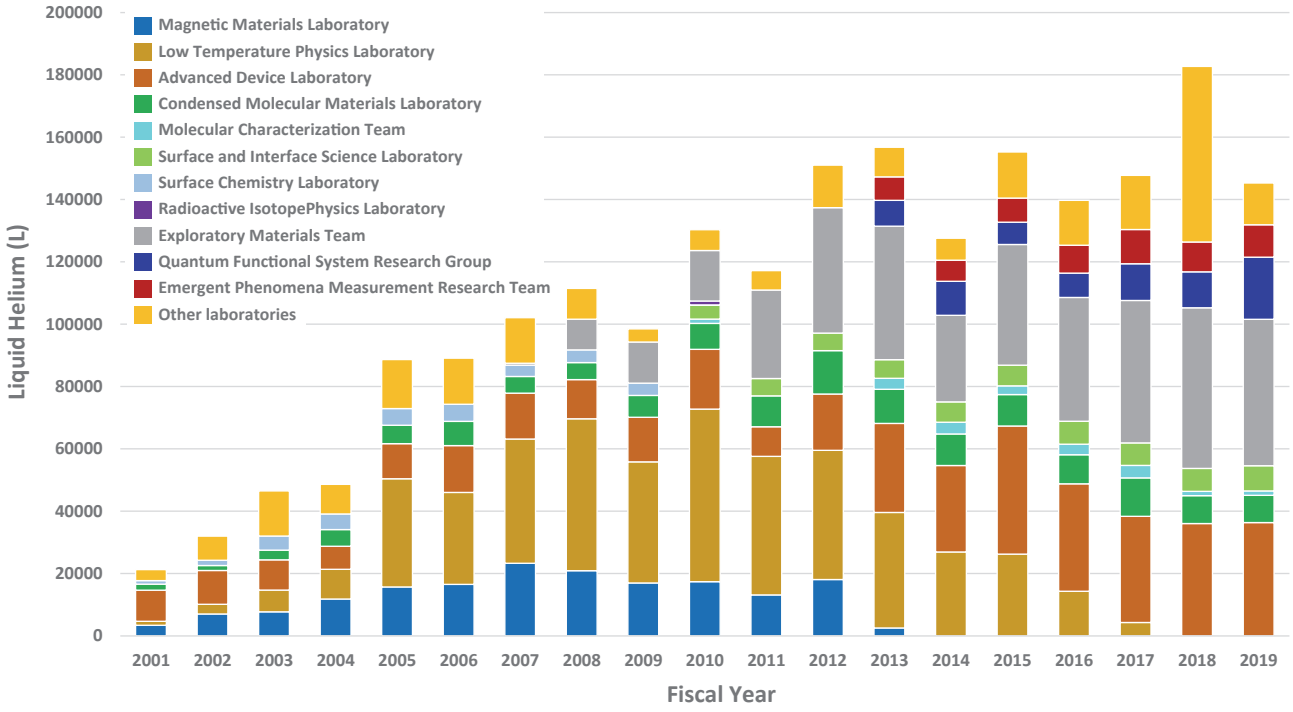


Fig. 1. Volumes of liquid helium supplied to the various laboratories for each fiscal year from 2001 to 2019.

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