Present status of the 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. The volumes of liquid helium supplied each year from 2001 to 2013 are shown in Fig. 1. The volume gradually increased from 2001 to 2008 but sharply increased in 2010, before decreasing sharply in 2011, and again sharply increasing in 2012.

We improved our recovery system in 2014. A new recovery line was connected to the existing line of the Nanoscience Joint Laboratory at the Emergent Matter Research Facilities.

The purity of helium gas recovered from laboratories gradually improved once the construction of the system was completed. Currently, the impurity concentration in the recovered gas rarely exceeds 200 ppm. The volume of helium gas recovered from each building in the Wako campus and 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, such as the Cooperation Center building of the Advanced Device Laboratory, the Chemistry and Material Physics building, and the Nanoscience Joint Laboratory building, increased to more than 90%.

However, the system experienced malfunctioning at the end of September 2014. The motor of helium compressor failed and we could not supply liquid helium for a period of two and a half months. One cause of motor failure was deterioration due to age. We updated the inverter of the helium compressor in March 2014.

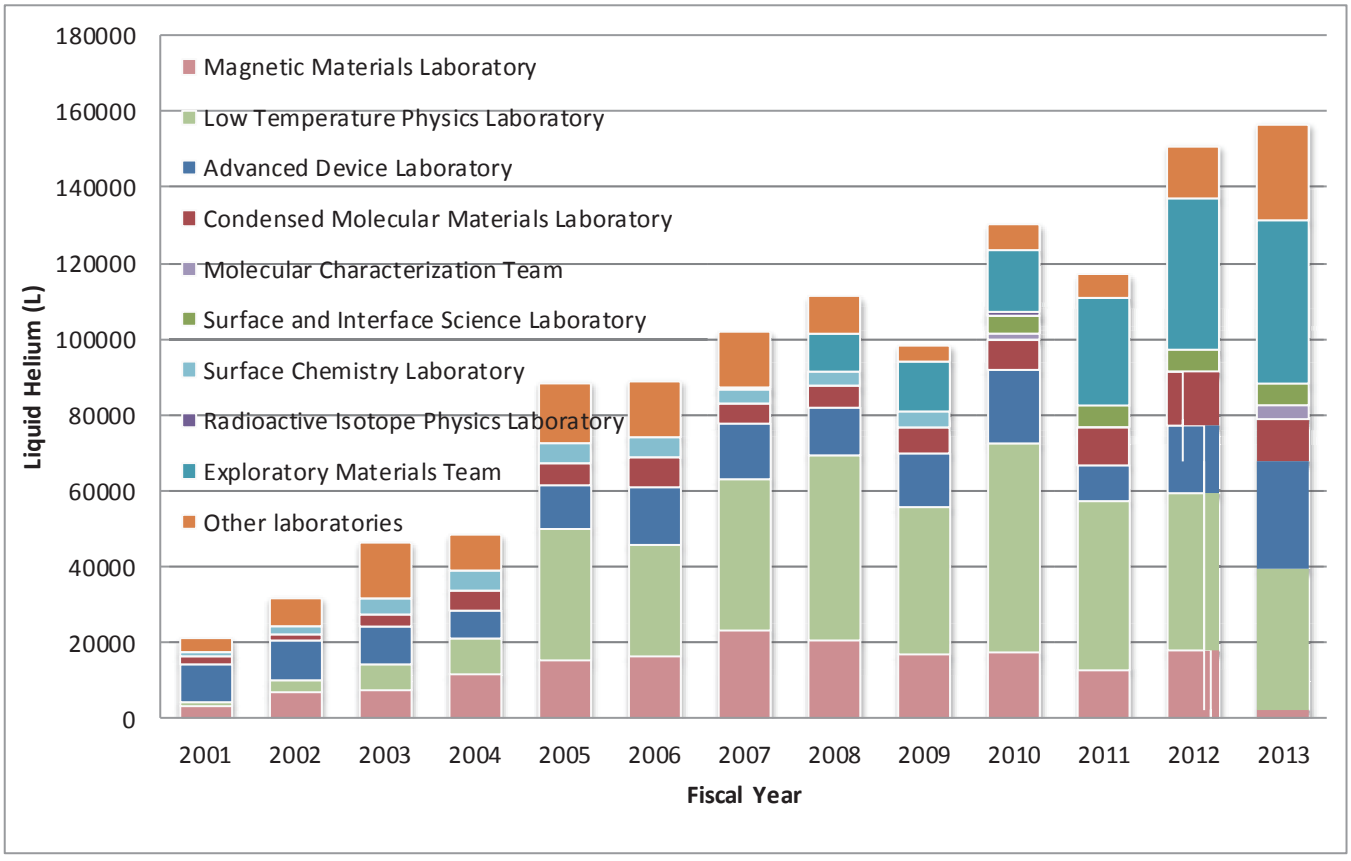

Fig.1. Volumes of liquid helium supplied to laboratories for each fiscal year from 2001 to 2013

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References

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