Improvement of the operational settings of a helium purifier leading to a higher purity of the recovered gas

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Introduction
In recent years, several universities that renewed their helium liquefier system have reported that solid hydrogen was mixed within the liquid helium produced by a helium liquefier [1-3]. The University of Tsukuba has also installed a Linde L280 helium liquefier system in October 2010. Similar to other universities, cases where the helium flow of cryogenic equipment with flow impedance (equipment to control temperature while limiting the flow of helium by a filter and aperture) was blocked began to be reported around March 2012. In this paper we focused on the internal purifier of the helium liquefier for the problem where solid hydrogen is mixed in the liquid helium produced by a helium liquefier. We adopted a new method to monitor the purity of the gas recovered from the internal purifier with a simple helium gas purity meter. This enabled us to improve the purity of the recovered gas from 33% to 99% by changing the cold end temperature of the purifier from 32.5K to 22K. From this, we found that it is possible to reliably determine the internal purifier operating conditions, which are the solution to the problem where solid hydrogen is mixed, and this is reported below.

New Method!

Before improvement of the operational setting of helium purifier

Cold end temperature TI3475=32.5K, cold flow F3410=120 ℓ/min, regeneration completion temperature TI3465=140K, and heater control output R3470=18%

After improvement of the operational setting of helium purifier

Cold end temperature TI3475=26K, cold flow F3410=180 ℓ/min, regeneration completion temperature TI3465=145K, and heater control output R3470=22%

Conclusion
The purifier operating conditions of commercially available helium liquefiers are determined by adjusting the cold end temperature, the cold flow, the regeneration completion temperature and the heater temperature. As a new method to determine the purifier operating conditions, we monitored the purity of the gas recovered from the purifier and succeeded in improving the recovered gas purity during purifier regeneration operation from 33% to 99%. This enabled us to reliably determine the internal purifier operating conditions.

References