§19. Separation of Hydrogen Deuteride from Hydrogen Gas

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Recently the purity of hydrogen gasses used for the experiments at the plasma devices has been strictly discussed in order to decrease neutron emmision. In the case of talking the purification of Hydrogen gasses supplied by the company, however, the contamination of hydrogen deuteride is ignored. Natural wataer contains 0.032% of HD-O. On the normal process of producing hydrogen gasses, like the electrolytic separation, deuterium can be excluded, but hydrogen deuteride cannot be.

We measured the contamination of hydrogen deuteride in highly purified hydrogen gasses, prepared by several companies. We used the gas chromatograph, settled in KEK[1]. This gas chromatograph system is specialized to separate He from hydrogen isotopes at 77K. In fig.1 we showed the typical spectrum of gas chromatgraph. We found that the hydrogen gasses of same purity showed the different condensation rates of deuteron hydride as table 1.

We tried to separate hydrogen deuteride from hydrogen, using the distillation method by the difference of vapor pressure among hydrogen isotopes. In fig.2. our cryogenic system is shown. It is composed of the cryostat with liquid Helium continuous flow system[2] and the reclaimer. The reclaimer comprises the hydrogen reserver, pumping system of hydrogen gas, and the hydrogen sample holder. The phase transition was monitored directly through the window on the wall of cryostat. We repeated hydrogen solidification and gas recovery, and then recycled the purified hydrogen gas.

The analysis is now underway.

References

[1] S.Sakamoto, UT-MLSL Annual Report 12(1993)p10.

[2] S.Ishimoto et.al., Nucl. Instr. Method A(2001) to be published.

company	gas ID	hydrogen purity(%)	HD(ppm)
A	C	99.999999	150
	D	99.9999995	150
B	E	99.999999	100
	F	99.99999	30

Table 1. Hydogen Deuteride condensation in purified Hydrogen gas.

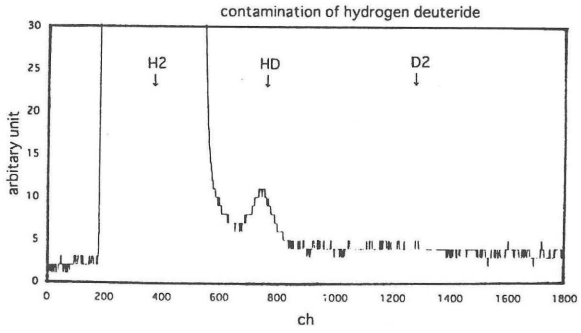

Fig.1. An example of spectrum of gas chromatography.

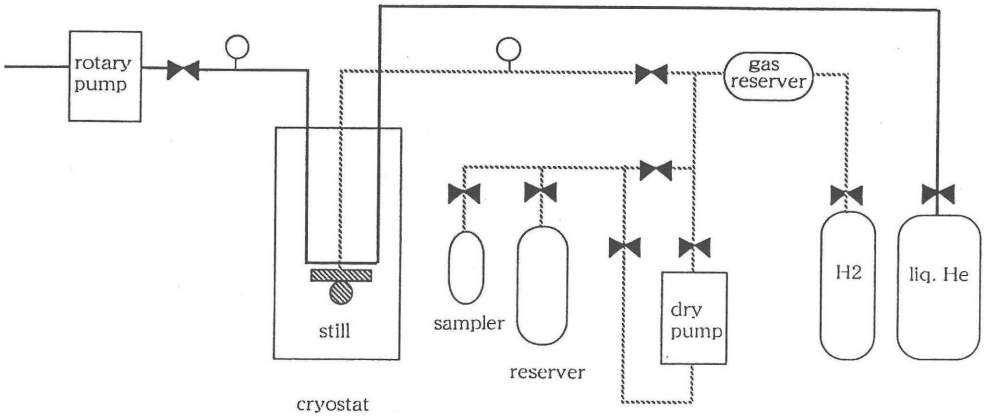

Fig.2 The schematic view of experimental set up.
— shows helium continuous flow line. - - shows H2 gas supply and recovery system.