## §5. Construction and Operation of Flibe Thermal Convection Loop System

Kondo, M., Nagasaka, T., Muroga, T., Sagara, A., Noda, N.,
Nishimura, M., Suzuki, A., Terai, T. (Univ. Tokyo)

Compatibility of structural materials with molten salt LiF-$BeF_2$ (LiF66mol%-$BeF_2$34mol%: Flibe) is one of the critical issues for the development of fusion reactor with liquid Flibe blanket system[1]. In the present study, Flibe thermal convection loop system was developed and operated for corrosion study.

Figure 1 shows the photo and schematic of Flibe thermal convection loop and ampul. These systems were set up and operated in Tokyo University. Flibe ingot of 200cc was placed in the ampul in glove box (Fig.2). Table 1 shows impurity in Flibe. Flibe was melted at the temperature above the melting point of 460°C in the ampul, and charged into the loop by the pressurizing the ampul at 0.13MPa with the loop pressure of 0.11MPa. In the ampul, the Flibe immersion part was all made of Ni including the level meter and sheathe of thermocouples. The loop was made of SS316 (18Cr-12Ni-2Mo) steel.

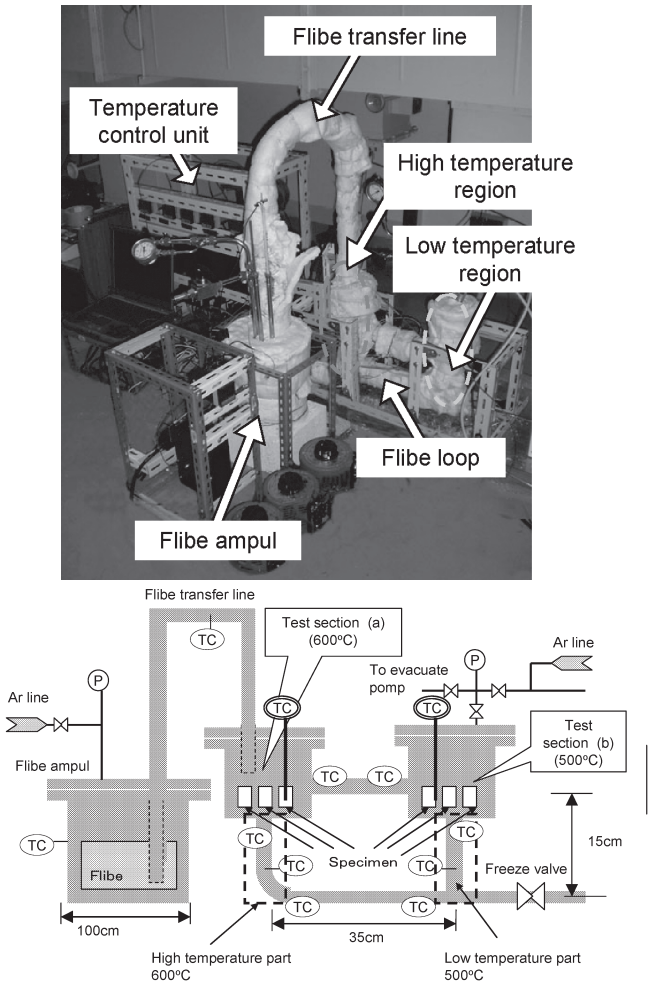


Fig. 1 Flibe loop and ampul

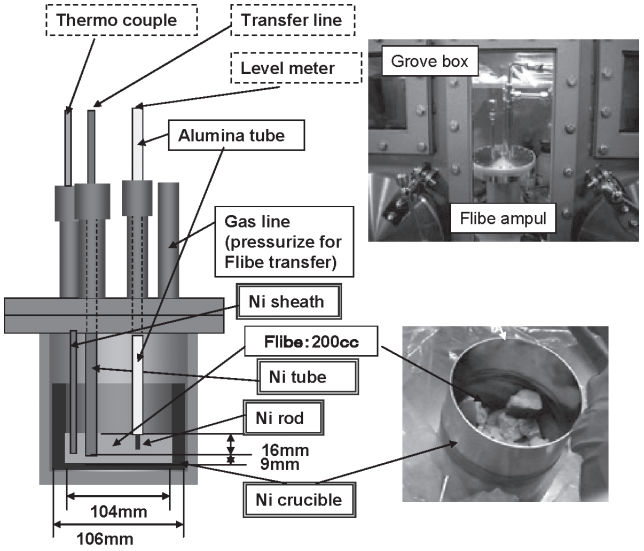


Fig. 2 Flibe ampul

The loop was operated at conditions presented in Table 2. The temperature difference between the high temperature region of 600 °C and the low temperature region of 500 °C was 100 °C, and this made the density difference and the driving force to make Flibe convection in the loop. The flow velocity was estimated from the equilibrium equation of driving force and pressure drop.

In the loop, rectangular plate type specimens of JLF-1, SS316L and SS410 were placed (Fig. 1). Their chemical components are presented in Table 3.

The specimens are going to be taken out after 200 hour exposure. The adhered Flibe on the specimens are melted and removed in liquid LiCl-KCl (melting point: 357°C). The loop tube is going to be broken into some parts by using glove bag, and corrosion of the inner tube wall will be investigated. The results of the present corrosion study are going to be presented in the international conference of ICFRM-13 [1].

Table 1 Impurity of Flibe (unit: wt%)

| | Cr | Fe | Ni | W | Mo |
|---|---|---|---|---|---|
| Flibe | 34 | 2 | 9 | <1 | <1 |

Table 2 Test conditions

| | | |
|---|---|---|
| Temperature (°C) | High temperature region | 600 |
| | Low temperature region | 500 |
| Flow velocity (cm/s) | 3 (Estimation) | |
| Inventory (cc) | 120 | |
| Operation time (hour) | 200 | |
| Test specimen | JLF-1, SS316, SS410 | |

Table 3 Chemical components of test materials (unit: wt%)

| | Cr | Ni | Mo | W | Fe |
|---|---|---|---|---|---|
| JLF-1 | 8.92 | - | - | 2 | Bal. |
| SS316L | 16.7 | 11.2 | 2 | - | Bal. |
| SS410 | 12 | - | - | - | Bal. |

Reference

(1) Sagara, A., et al., Fusion Science and Technology, **47** (2005) 524
(2) Kondo, M., et al., Proceedings of ICFRM-13, (2007).