Development of Li ion source with NEOMAFIOUS

T. Yorita, M. Kibyashi and K. Hatanaka
Research Center for Nuclear Physics, Osaka University

NEOMAFIOS [1] is the 10 GHz ECR ion source for light and medium mass ions. Li ion, one of those ions, is currently produced by a LiF rod sputtering method with He support gas and more intense ion beam is needed for some experiments.

For that purpose, a Li oven system has been developed with refering to DECRIS-14-2, Dubna [2]. The details of the Li oven we made this time is shown in Figure 1. The oven evapolates Li from pure metal and the Li vapor is introduced into the ECR plasma chamber. Figure 2 shows charge distributions of ions with several conditions of oven temperature and position. In case of 416°C, the maximun intensity case, we obtained about one order intense Li ions in comparison with LiF sputtaring method (See Table 1). According to the Li vapor pressure calculation (Table 2), higher temperature operation seems to be able to create more intense beam, but in such case like 450°C, the oven temperature got out of control because of positive feedback by plasma heating.

The developments are in progress to realize a long term stability of the system.

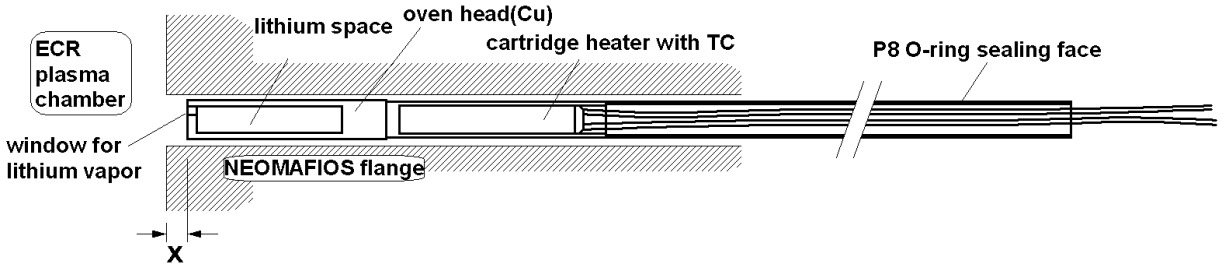

Figure 1: Li micro oven system: Li metal is installed inside the oven head made of copper. Oven head is heated from back and lithium vapor goes through window to plasma chamber. Heater power and oven position are controled and the oven temperature is stabilized with the PID method.

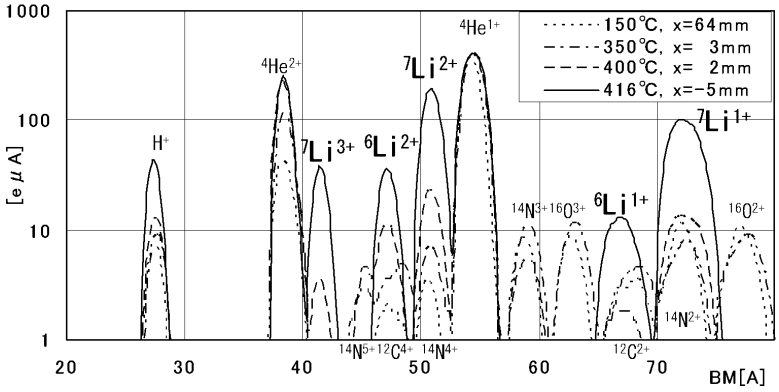

Figure 2: Ion charge distribution spectrum. The extraction voltage is 15 kV. Support gas is ^{4}He. The x values correspond to oven position shown as x in Fig. 1.

	+1	+2	+3
^{7}Li (LiF rod)	10	16	2.5
^{7}Li (Li metal with oven)	102	193	42

Table 1: Intensity of ^{7}Li ion (eμA) and charge state in case of 416°C and x=-5. LiF data are from [1].

temp.(°C)	vapor pressure(Pa)
150	1.1×10^{-9}
350	1.5×10^{-3}
400	1.4×10^{-2}
416	2.6×10^{-2}
450	9.3×10^{-2}

Table 2: Temperature vs. vapor pressure of Li calculated with coeffients from [3].

References

[1] M. Tanaka *et al.*, RCNP Annual Report 1991 p215 ; K. Takahisa *et al.*, RCNP Annual Report 1994 p190 ; H. Takahisa *et al.*, RCNP Annual Report 1996 p172 ; H. Tamura *et al.*, RCNP Annual Report 1997 p289

[2] A. Efremov *et al.*, Review of Scientific Instruments Vol.69, No.2, 1998, p662

[3] C.B. Alcock, Handbook of chemistry and physics, 73rd Edition, p.5-80