

## §14. Basic Experiments on Particle Control with Lithium Coating

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Recently, *in situ* coating of thin lithium layers with evaporation [1] and pellet injection [2] has been developed. Here, we carried out basic laboratory experiments on wall conditioning with lithium evaporation to make its effects clear.

The experiment was performed in a small laboratory device having the inner stainless steel vessel bakable in the range 30 to 400 °C. An oven containing solid lithium is heated to 500 °C in vacuum and the evaporated amount of lithium is measured by a deposition monitor.

To evaluate the chemical activities of lithium surfaces, O<sub>2</sub>, CO and CH<sub>4</sub> gases were separately fed into the vessel, immediately after lithium evaporation. As shown in Fig. 1, the gettering effect is clearly observed after lithium deposition except for the case of hydrogen. We can calculate the total amount of oxygen atom gettered by the lithium layer [O], from the time integration of change in the oxygen pressure. For the total amount of the deposited lithium [Li], the experimental results are close to the relation [Li]=2[O], thus suggesting the formation of lithium oxide Li<sub>2</sub>O.

After lithium coating, a dc glow discharge in hydrogen was turned on and the resultant change in the pressure was measured as shown in Fig.2. These data give the amount of hydrogen atoms incorporated into the lithium layer [H]. The experimental results roughly agree with the relation [H]=[Li], suggesting the formation of LiH.

Helium glow conditioning is available for the partial recovery of lithium from losses to oxygen gettering and hydrogen uptake. Wall conditioning with the use of lithium has successfully been performed in JIPP T-IIU, where significant reductions of oxygen and carbon contents were observed in ohmic as well as NBI discharges.

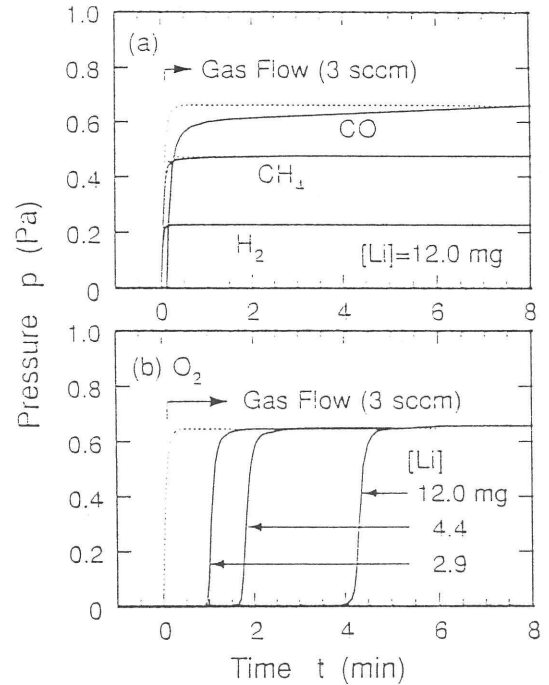


Fig.1. Time variation of (a) H<sub>2</sub>, CH<sub>4</sub>, CO and (b) O<sub>2</sub> pressures. Solid and dashed lines indicate the results with and without lithium coating, respectively.

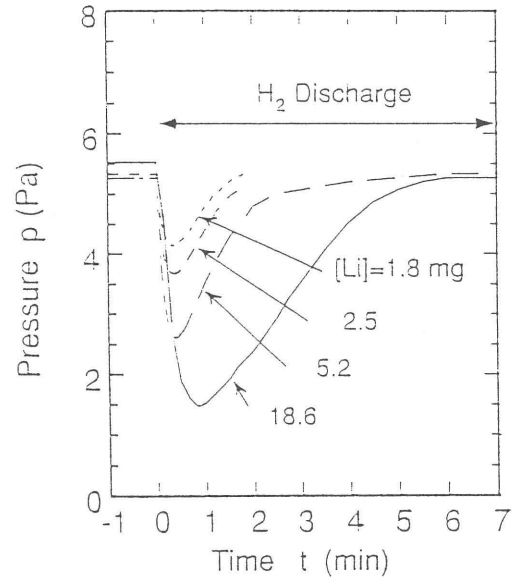


Fig. 2. Change in the H<sub>2</sub> pressure in a pulsed glow discharge for different lithium weights [Li].

### References

- 1) Isozumi, T., Yoshida, S. and Sugar, H., *Kaku-Yugo Kenkyu* **60** (1988) 304.
- 2) Snipes, J. A., et al., *J. Nucl. Mater.* **196-198** (1992) 686.