23Da01

# $Li_2TiO_3$-$Li_4SiO_4$混合セラミックス材におけるトリチウム回収に及ぼす鉛添加効果

# Role of lead addition on tritium recovery for $Li_2TiO_3$-$Li_4SiO_4$ mixed ceramic material

三福寺 旭[1)]、平田 詩織[2)]、周 啓来[3)]、小林 真[4)]、Guangfan Tan[5)]、大矢 恭久[1)]
SANFUKUJI Asahi[1)], HIRATA Shiori[2)], ZHOU Qilai[3)], KOBAYASHI Makoto[4)],
TAN Guangfan[5)], OYA Yasuhisa[1)]
1)静岡大理学部、2)静岡大院総合科学技術 3)武漢理工大、4)核融合研、5)北京科技大
1) Fac. of Sci., Shizuoka Univ., 2) Grad. School of Integrated Sci. and Tech., Shizuoka Univ.,
3) Wuhan Univ. Tech., 4) NIFS, 5) Univ. Sci. Tech. Beijing

## 1. Introduction

Lithium titanate ($Li_2TiO_3$) and lithium silicate ($Li_4SiO_4$) are candidates as solid tritium breeding materials. $Li_2TiO_3$-$Li_4SiO_4$ mixed ceramic materials are expected to have both advantages. Lead (Pb) is a neutron multiplier that contributes to the improvement of the tritium breeding ratio and has a lower affinity with tritium. The addition of Pb into Li ceramics is expected to have a potential advantage for efficient tritium recovery. In this study, effect of lead addition on tritium recovery for $Li_2TiO_3$-$Li_4SiO_4$ mixed ceramic materials was investigated.

## 2. Experiment

Powder samples of $Li_2TiO_3$-$Li_4SiO_4$-2%Pb were prepared. The sample was irradiated with neutron at Kyoto University Reactor (KUR) with the neutron fluence of $3.96\times10^{16}$ n $cm^{-2}$. After the neutron irradiation, Tritium Thermal Desorption Spectrometry (TDS) was performed from R.T. to 1113 K with heating rates of 10 - 30 K $min^{-1}$. Isochronal annealing experiment was also performed. The temperature was increased by every 25 K from R.T. to 748 K and every annealing time was 5 min. After each annealing step, the measurements of Electron Spin Resonance (ESR) were carried out.

## 3. Results and discussion

Figure 1 shows Tritium TDS spectra for $Li_4SiO_4$-$Li_2TiO_3$-2%Pb samples with various heating rates. Large T desorption was observed at the temperature range of 700 K. The peak position has shifted toward higher temperature side as the heating rate increased, namely 677 K, 699 K, and 729 K for 10, 20, 30 K $min^{-1}$. The activation energy for peak2 was evaluated to be 0.76 eV, which was higher than that of the powder $Li_4SiO_4$-$Li_2TiO_2$ sample [1]. Fig. 2 shows the annihilation behavior of E'-center as a function of annealing temperature. The amount of irradiation defects was initially increased, then decreased quickly above 600 K. It was mostly disappeared at 750 K. By comparing Figs. 1 and 2, the recovery temperature of defects and T desorption were almost consistent.

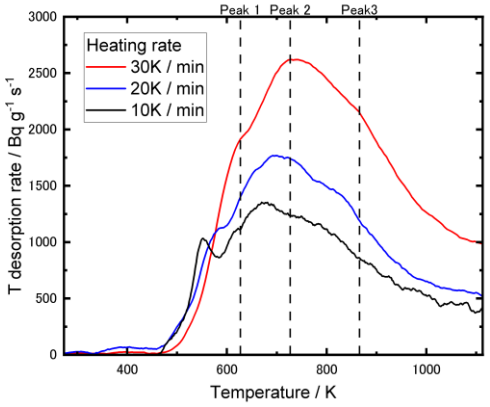


Fig. 1 Tritium TDS spectra for $Li_4SiO_4$-$Li_2TiO_3$-2% Pb samples with neutron fluence of $3.96\times10^{16}$ n $cm^{-2}$.

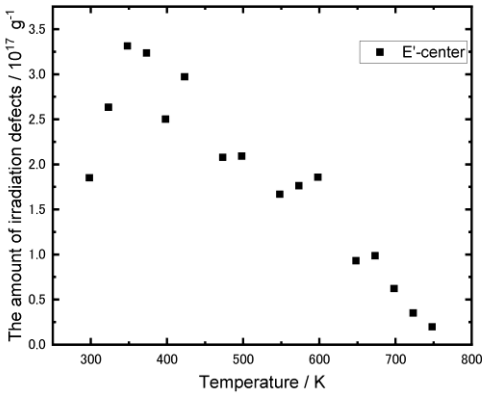


Fig. 2 E'-center as a function of annealing temperature.

Reference

[1] Guangfan Tan, unpublished data (under preparation).