

# Tritium Extraction from Heating Aluminum under Melting Temperature of Aluminum

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Aluminum contaminated to tritiated water was heated and tritium was extracted from aluminum stick sample at the temperatures under melting temperature of aluminum, 660 °C. Extracted tritium was analyzed by LSC (Liquid Scintillator Cocktail). Before heating, aluminum with the thickness of 0.4 mm was cut into several pieces (1, 5, 10, and 15) to check tritium extraction according to the number of sample's piece. In this study, to determine whether tritium was completely decontaminated, standard radioactivity concentration was set to 0.1 Bq/g, which is 0.01 times the WHO drinking water tritium standard, 10 Bq/g. If the mass of aluminum stick samples is much less than 1 g, MDA (Minimum Detectable Activity) value can be higher than 0.74 Bq/g, which is the U.S. tritium standard. And then, tritium radioactivity evaluation by comparison with MDA value can not secure safety. When aluminum stick samples of 0.4 mm thickness were heated at 400 °C for 15 hours, radioactivity concentrations of extracted tritium every 3 hours from 1 piece of sample were  $65.517 \pm 0.765$ ,  $3.277 \pm 0.139$ , 0, 0, 0 Bq/g in Table 1. When the counting rates of LSC cocktail is lower than the background counting rates and the net counting rates become negative, it was marked as 0. Except for sample of 15 pieces, tritium concentrations from all samples were lower than MDA value after heating for 6 hours. And then, after heating for 9 hours, those became 0. It was confirmed that tritium can be completely extracted from aluminum with the thickness of 0.4 mm when aluminum was heated at the temperature of 400 °C for 15 hours. In case of sample of 1 piece, time to become zero was shortest in all sample. It was shown that at all heating temperatures, cutting of aluminum stick sample did not have a dominant effect on tritium extraction rate from aluminum stick sample.

Table 1. radioactivity concentration of extracted tritium from 0.4 mm aluminum at 400 °C for 15 h

Pieces	Radioactivity concentration of extracted tritium (Bq/g)					MDA(Bq/g)
	0-3 hours	3-6 hours	6-9 hours	9-12 hours	12-15 hours	
1	$65.52 \pm 0.77$	$3.28 \pm 0.14$	0	0	0	$0.63 \pm 0.07$
5	$56.77 \pm 0.57$	$7.46 \pm 0.20$	$0.36 \pm 0.02$	0	0	$0.35 \pm 0.04$
10	$60.62 \pm 0.76$	$4.19 \pm 0.17$	$0.45 \pm 0.03$	0	0	$0.57 \pm 0.07$
15	$48.51 \pm 0.67$	$6.62 \pm 0.22$	$0.70 \pm 0.04$	0	0	$0.56 \pm 0.07$

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