

OBT measurement of vegetation by mass spectrometry and radiometry

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Organically bound tritium (OBT) is a key target in radiation exposure to tritium because OBT ingested through foods occupies a considerable fraction of tritium intake in man. A standardized OBT measurement method is not well established due to complexity of OBT matrix and existence of labile binding site in the matrix for hydrogen isotopes. We present in this paper the results OBT measurement carried out in Japan for the vegetation sample which is supplied as a reference material for cross check work of tritium laboratories.

Two determination techniques were applied here, radiometry and mass spectrometry. For radiometry, the dried vegetation was washed to remove tritium that exists in the labile binding sites by immersing the sample in tritium-free water. The washed sample was dried and combusted with a combustion apparatus developed for OBT measurement. The water yielded by combustion was purified by distillation. Tritium activity was measured by liquid scintillation counting (LSC) using a low background counter, Aloka LB-5. The tritium concentration of combustion water (Bq/L) is converted to tritium activity of dry basis (Bq/kg) using hydrogen content determined by elemental analysis. The tritium removed from the sample by washing was also determined by LSC. For mass spectrometry, no treated vegetation was sealed in (Al-Si) glass containers and stored at -30°C for appropriate periods to wait ³He growth by decay of OBT. The glass container was set on the mass spectrometer, VG-5400 Micromass and amounts of ³He appeared in the glass containers were determined. The contamination of the atmospheric ³He during the sample preservation was corrected from ⁴He simultaneously determined by mass spectrometry. The obtained tritium concentration is dry basis (Bq/kg). The tritium concentrations determined by two methods were compared and validity of OBT determination methods was discussed.