Analysis of ^{99}Tc in Natural and Treated Waste Waters Using Empore™ Technetium Rad Disks

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ABSTRACT

A new method to analyze natural water (pond, stream) and treated waste water (lagoon, condensate) samples for ^{99}Tc activity using Empore™ Technetium Rad Disks has been implemented at the West Valley Demonstration Project (WVDP). This method replaces the traditional procedure that extracts technetium into methyl ethyl ketone (MEK). The Empore™ method has the advantages of larger sample size, easier sample preparation, higher sensitivity, and no generation of mixed waste. The ^{99}Tc activity on the disk is measured by either gas flow proportional counting or liquid scintillation counting (LSC). The disks also extract nitrate ions that can interfere with gas flow proportional counting but not with LSC. Preliminary work with high-level radioactive waste (HLW) samples indicates extraction of additional ß emitting isotopes along with technetium on the Empore™ Technetium Rad Disk. These experiments did not provide any conclusive information regarding the identification of the interfering ß emitters. This paper discusses the applicability of the Empore™ Technetium Rad Disk to various sample types and the choice of counting techniques used for

different samples, especially those containing nitrates.

EMPORE		MEK
Advantages	Disadvantages	
Little or no sample preparation.		Samples must be in 6.5 N NaOH.
	If HNO_3 needed for dissolution or present in sample, must convert or use LSC.	Tolerant of NO3.
No MEK, therefore no mixed waste.		Uses 15 mL of MEK, 10 mL goes to the air, 5 mL goes to mixed waste.
Easy to perform with very large sample sizes, up to 20 L.		Difficult to extract very large volumes without special equipment.
Since nothing added to sample, easy to get rid of waste or use filtrate for other analyses.		Caustic waste must be neutralized. Mixed waste must be collected.
Method is very fast.		Takes time for extraction.
Results are comparable to MEK extraction.		
Much lower MDA are attainable.		
	Problems with HLW. Unknown interferences.	Very little interferes.
	RuO4 interferes	Same here.
	Membranes cost a small fortune	Ain’t cheap getting rid of mixed waste.