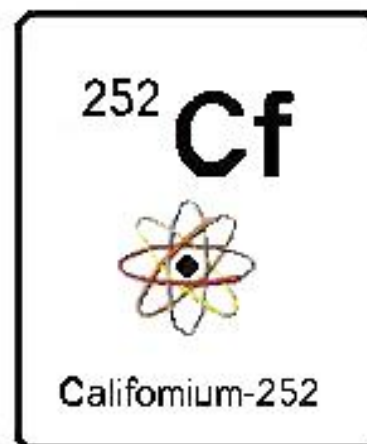


Validation of Rapid Radiochemical Method for Californium-252 in Water, Air Particulate Filters, Swipes and Soils for Environmental Remediation Following Radiological Incidents

INTRODUCTION

In the event of a radiological/nuclear contamination event, the response community would need tools and methodologies to rapidly assess the nature and the extent of contamination. To characterize a radiologically contaminated outdoor area and to inform risk assessment, large numbers of environmental samples would be collected and analyzed over a short period of time. To address the challenge of quickly providing analytical results to the field, the U.S. Environmental Protection Agency (EPA) developed a robust analytical method. This method allows response officials to characterize contaminated areas and to assess the effectiveness of remediation efforts, both rapidly and accurately, in the intermediate and late phases of environmental cleanup. Improvement in sample processing and analysis leads to increased laboratory capacity to handle the analysis of a large number of samples following the intentional or unintentional release of a radiological/nuclear contaminant.

In 2005, the Integrated Consortium of Laboratory Networks (ICLN) was formed by ten federal agencies with laboratory networks across the government. The agencies recognized the need to ensure adequate laboratory infrastructure to support response and recovery actions following a major radiological/nuclear incident. The ICLN provides a national infrastructure with coordinated and operational laboratory network systems that provide timely, high-quality, and interpretable results for early detection and effective response consequence management. In 2006, EPA's Homeland Security Research Program (HSRP) established a relationship with EPA's Office of Radiation and Indoor Air (ORIA) in response to laboratory capacity needs in support of EPA's Environmental Response Laboratory Network (ERLN) and the ICLN. The HSRP and ORIA coordinate radiological reference laboratory priorities and activities in conjunction with EPA's Partner Process. As part of the collaboration, HSRP worked with ORIA to publish a rapid radioanalytical method for analysis of Californium-252 (^{252}Cf) in environmental matrices.



EPA's Homeland Security Research Program (HSRP) develops products based on scientific research and technology evaluations. Our products and expertise are widely used in preventing, preparing for, and recovering from public health and environmental emergencies that arise from terrorist attacks or natural disasters. Our research and products address biological, radiological, or chemical contaminants that could affect indoor areas, outdoor areas, or water infrastructure. HSRP provides these products, technical assistance, and expertise to support EPA's roles and responsibilities under the National Response Framework, statutory requirements, and Presidential Directives.

RAPID RADIOCHEMICAL ANALYTICAL METHODS DEVELOPMENT

The anticipated demand for analysis of pure alpha emitters such as ^{252}Cf in contaminated environmental samples resulting from a radiological dispersal device (RDD) scenario would present significant challenges to responding laboratories. Such a scenario would result in sample throughput demands orders of magnitude greater than levels that laboratories currently experience. This would quickly overwhelm their ability to provide the radioanalytical results needed to support decision-making.

Selected Analytical Methods for Environmental Remediation and Recovery (SAM) 2012, EPA/600/R-12/555, lists methods for select radionuclides to be used to evaluate the nature and extent of contamination and the effectiveness of decontamination. The methods listed in SAM are well-established, well-proven methods used for screening, compliance monitoring and site-cleanup activities but were not developed for cases where quickness and high throughput were concerns. This method represents the first performance-tested, rapid method available for analysis of ^{252}Cf in four environmental matrices (water, air particulate filters, swipes, and soils) in response to a radiological incident.

Development and use of this californium rapid method by the ERLN-member laboratories fulfills the need for consistent and accurate analysis in the face of a large number of samples over a short period of time. Using this method will improve confidence in the data, permit sharing of the sample load between laboratories, improve data comparability, simplify the task of outsourcing analytical support to the commercial laboratory sector, and improve the follow-up activities of validating results, evaluating data, and making risk-management decisions. The rapid method will also accelerate existing analytical throughput times so that each laboratory can process a larger number of samples per day.

This is the first issue of a rapid method for ^{252}Cf in water, air particulate filters, soil, and swipe samples. Single laboratory validation testing shows that the method can achieve required objectives that are based on conservative risk or dose values for the intermediate and late phases of an emergency response. The methods also have been tested to determine the time within which a batch of samples can be analyzed. For the matrices of interest, analysis results for a batch of samples contaminated with ^{252}Cf can be provided to the field within 8 hours for water samples; 10 hours for air particulate filters; 9.75 hours for soil samples; and 11.25 hours for swipe samples. Table 1 provides information for each matrix type.

Table 1: Californium-252 Environmental Methods*

Matrix	Analytical Action Level	Minimum Detectable Concentration **	Estimated Time to Obtain Sample Analysis Results
Water	15 pCi/L	1.5 pCi/L	8 hours
Air Filters	4.4 pCi/filter	0.44 pCi/filter	10 hours
Soils	1.4 pCi/g	0.14 pCi/g	9.75 hours
Swipes	0.89 pCi/swipe or filter	0.15 pCi/swipe or filter	11.25 hours

* Information in table taken from the method listed below.

**pCi = picocurie

The new method will accelerate the analytical turnaround time necessary leading to quicker sample processing. It also provides quantitative results that meet measurement quality objectives. The methods are designed to be used during the intermediate and late phases of the emergency response to a nuclear or radiological incident of national significance, such as the detonation of an improvised nuclear device or a radiological dispersal device. It should be noted that the method was not developed for compliance monitoring and should not be considered as having EPA approval for that or any other regulatory program.

LINK TO CALIFORNIUM-252 METHOD

Validation of Rapid Radiochemical Method for Californium-252 in Water, Air Particulate Filters, Swipes and Soils for Environmental Remediation Following Radiological Incidents, EPA 402-R16-002, Revision 0, July 2016. <https://www.epa.gov/radiation/rapid-radiochemical-methods-selected-radionuclides>

CONTACT INFORMATION

For more information, visit the EPA Web site at <https://www.epa.gov/homeland-security-research>.

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