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technical FACT SHEET
BUILDING A SCIENTIFIC FOUNDATION FOR SOUND ENVIRONMENTAL DECISIONS

Rapid Radiochemical Method Isotopic Uranium (^{238}U, ^{235}U, or ^{234}U) in Water Samples

EPA's **rapid radiochemical methods** expedite analytical turnaround time for selected radionuclides while providing quantitative results that meet measurement quality objectives. Methods are applicable to samples where contamination is from either known or unknown origins. This fact sheet is intended for radioanalytical laboratory personnel, decision makers within the incident command structure, additional reoccupancy decision makers (e.g., state and local public health), and other field environmental response personnel.

Method Summary: This method is based on the sequential elution of interfering radionuclides as well as other components of the matrix by extraction chromatography to isolate and purify uranium (^{238}U, ^{235}U, or ^{234}U). Uranium is quantified by counting with alpha spectrometry. The method uses vacuum assisted flow to improve the speed of the separations. Prior to the use of the extraction resins, a water sample is filtered as necessary to remove any insoluble fractions, equilibrated with ^{232}U tracer, and concentrated by either evaporation or calcium phosphate [$Ca_3(PO_4)_2$] precipitation. The sample test source is prepared by microprecipitation with neodym (III) fluoride. Standard laboratory protocol for the use of an alpha spectrometer should be used when the sample is ready for counting.

Time to Process: 7 hr

Includes radiochemical processing and counting

Compare to traditional method (EPA 908.0): 9–14 hr

Measurement Quality Objectives

Required method uncertainty: 2.6 pCi/L
Analytical action level (AAL): 20 pCi/L
Required relative uncertainty: 13% above AAL
Minimum detectable concentration: 1.5 pCi/L
Sample quantity: ~ 200 mL
Count time: At least 1 hr

Sample Preservation

Samples should be collected in 1 L plastic containers
Analysis within 3 days of sampling: No preservation required
Holding time >3 days: Adjust pH to <2 with concentrated nitric acid

Waste Generated per Sample

~ 65 mL of acidic and 45 mL of slightly acidic waste
~ 1 mL hydrofluoric acid
~ 8 mL ethanol
~ 100–1000 mL pH neutral decanted solution if $Ca_3(PO_4)_2$ coprecipitation performed
2 resin cartridges

Method Access:
https://www.epa.gov/sites/production/files/2015-06/documents/uranium_in_water_rev_0_1_epa_402-r-10-001e.pdf

Method Application

The method is specific for soluble ^{238}U, ^{235}U, and ^{234}U in drinking water and other aqueous samples.
Application of this method should be validated by the laboratory using the protocols provided in *Method Validation Guide for Qualifying Methods Used by Radiological Laboratories Participating in Incident Response Activities*, or the protocols published by a recognized standards organization for method validation.

Equipment and Supplies

Analytical balance: 10^{-4} g readability or better | **Cartridge reservoirs**: 10 or 20 mL syringe style with locking device, or equivalent | **Centrifuge and 250 mL flasks** | **Filter apparatus** with 25 mm diameter polysulfone filtration chimney, stem support, and stainless steel support or a single-use (disposable) filter funnel/filter combination | **Filters**: 0.45 µm membrane; 25 mm polypropylene with 0.1 µm pore size or equivalent | **Laboratory supplies**: 250 mL and 350 mL plastic/glass ware; 10 mL plastic culture tubes with caps; 100 µL pipettes and plastic tips; pH paper; stainless steel planchets or other sample mounts able to hold the 25 mm filter; tweezers | **Vacuum system**: box; pump or laboratory system; white inner tips; yellow outer tips | **Vortex mixer**

Contacts

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