Empore™

Solid Phase Extraction Disks

RAD-Disks Strontium, Radium and Technetium

General Information

Empore™ RAD Disks provide an efficient alternative to conventional radiochemical sample preparation methods that use wet chemistry or packed columns. A proprietary process is used to entrap adsorbent particles into a matrix of inert PTFE to create a mechanically stable sorbent disk. The disks can be used for purification and concentration of analytes from aqueous samples.

Empore RAD disks provide a sample prep solution for large volume aqueous samples. The disk format provides a large surface area for sorbent/sample contact. Fast flow rates and high throughput may be realized with use of an Empore RAD disk. RAD disks form convenient direct counting sources when used in applicable test methods.

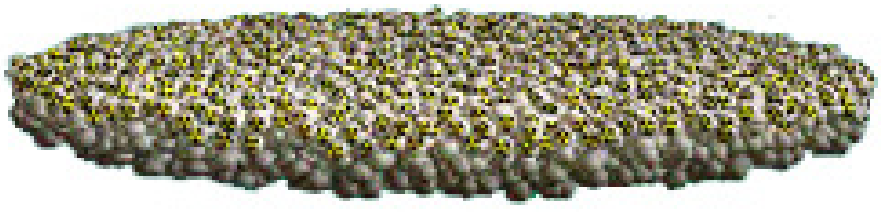
Product Information

Empore RAD disks are available in three selective sorbents – radium, strontium and technetium. These RAD disks are intended for quantitative determination of Radium isotopes 226 and 228, Strontium isotope 90, and Technetium isotope 99, respectively, from aqueous samples.

A water sample is passed through an Empore RAD disk. The loaded disk is dried and counted directly with a gas proportional counter or placed wet in a vial containing scintillation cocktail and counted with a liquid scintillation counter. In some methods the selected radioelement is extracted onto the disk and then eluted for quantitiation.

Suggested Product Applications

Sorbent	Suggested Applications	Product Number
		47 mm
Strontium Selective	Strontium-90	3290
Radium Selective	Radium-228 Radium-226	3291
Technetium Selective	Technetium-99	3292



CDS Analytical

Extraction Method with Strontium or Radium RAD Disks

Step 1: Sample Preparation

1. Acidify the sample to 2 M with nitric acid
2. If visible solids are present in the sample, pre-filter through a 0.45 µm filter if exclusion is desired.

Step 2: Extraction Disk Conditioning

Proper disk conditioning is critical for a successful extraction. Conditioning prepares the sorbent to interact efficiently with the sample matrix. **Failure to condition the extraction disk properly will result in erratic and low recoveries.**

1. Center the Empore™ Strontium RAD Disk (marked side down) on the base of the filtration apparatus and clamp the reservoir in place on top of the disk. **Empore™ RAD Disks are marked on one side for the convenience of the analyst when the radioisotope is counted directly from the disk.**
2. Condition the disk by adding 10 ml of methanol to the disk. Apply vacuum and pull approximately 1 ml through the disk. Vent the vacuum and allow the disk to soak for 60 seconds.
3. Apply vacuum and slowly draw the methanol through the disk, leaving the surface of the disk wet.
4. Wash the disk immediately with 20 ml of 2 M nitric acid under low vacuum. Flow rate should be no more than 50 ml/min. Leave 3 - 5 mm of liquid on the surface of the disk.

Note: *If disk should become dry while conditioning with methanol or acid, repeat these steps.*

Step 3: Sample Extraction

1. Pour the sample into the reservoir and apply low vacuum. The flow rate should not exceed 50 ml/min. Do not allow the disk to dry.
2. Rinse the disk with 20 ml of 2M nitric acid at the same flow rate.
3. Excessive air should not be drawn through the membrane since airborne Radon decay products could pose radiometric interferences if the disks are counted the same day.

For Strontium analysis, the end time of this rinse is recorded as the start of the Yttrium-90 ingrowths.

Note: *The disk should not be allowed to dry during the conditioning or the sample processing steps.*

For determination of Radium-228, the end time of this rinse step is recorded as the start of Actinium-228 ingrowth. At this point, depending on the test method, the disk may be set aside to allow for ingrowth of Actinium-228 which is subsequently eluted and counted (Test Method RA-195). Alternatively, the Radium may be eluted from the disk and actinium-228 separated by chemical procedures after the period of ingrowth as described in EPA 904.0 (1) (Test Method RA-295).

Following Test Method RA-395, the Radium-226 is determined by elution and transferring into a Radon bubbler. The subsequent de-emanation procedure for the separation of Radon-222 is taken directly from EPA Method 903.1 (2).

Note: *When using solvents or other chemicals, be sure to read and follow the manufacturer's precautions and directions for use.*

Step 4: Counting Options

Disks may be counted by either proportional or scintillation counting. The instrument type, counting times and frequency of counts are dictated by the isotope(s) of interest and the data quality objective. Radioactive ingrowth and decay corrections must be applied

- For use with a scintillation counter, place disk (before disk dries) into a vial containing scintillation cocktail.
- For use with a proportional counter, the loaded disk must be placed on a planchet obscuring "Side Down."

For additional information on test procedures and possible interferences, consult Test Methods:

RA-195: "Rapid Determination of Radium-228 in Water by Elution of Ingrown Actinium-228 from Empore™ Radium RAD Disks"
RA-295: "Rapid Determination of Radium-228 in Water Using Empore™ Radium RAD Disks"
RA-395: "Rapid Determination of Radium-226 in Water Using Empore™ Radium RAD Risks"
Test Method "Rapid Determination of Radiostrontium in Water using Empore™ Strontium RAD Disks"
DOE Method RP515 "Rapid Determination of Radiostrontium using Empore™ Strontium RAD Disks"

Extraction with Technetium RAD Disks

Step 1: Sample Preparation

No special collection, preservation or handling steps are necessary for this procedure. No "wetting" of the disk with methanol or other alcohol is necessary. Sample should not be acidified with nitric acid because of possible interference by nitrate ions.

1. Measure the sample aliquot. Depending on the activity present and the analytical detection limit required, this may vary from 100 ml or less to several liters.
2. If there is particulate matter present in the sample, use a pre-filter to remove any potential beta emitting interfering solids.

Step 2: Sample Extraction

1. Mount an Empore™ Technetium RAD Disk on the disk support. Place the side marked "Side Down" against the support
2. Pull the sample aliquot through the disk (70 kPa/0.7 bar vacuum). No adjustment of pH or wetting the disk is necessary

Step 3: Counting Options

Disks may by either proportional or scintillation counting.

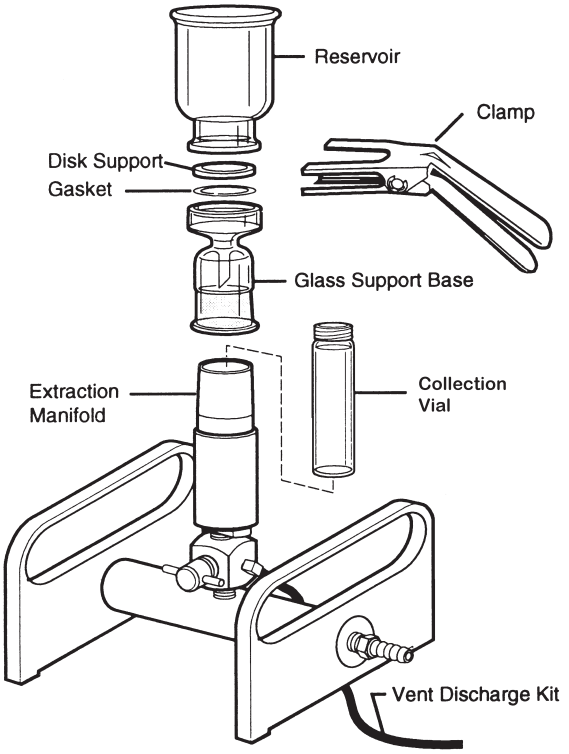
- For use with a scintillation counter, place disk into a vial containing scintillation cocktail.
- For use with a gas proportional counter, the loaded disk must be dried completely and placed on a 70 ° C oven for 10 minutes. Mount the disk in a planchet obscuring "Side Down."

For additional information on testing procedure and possible interferences, consult Test Method TC-196 "Rapid Determination of Technetium in Water using Empore™ Technetium RAD Disks."

Product Characteristics

Composition	90 % or greater sorbent particle 10 % or less PTFE
Thickness	0.50 mm ± 0.05 mm
SPE Flow Rate	< 10 min/l DI H_2O @ 25 ° C @ 70 kPa/0.7 bar (47 mm disk)
Particle Size	12 µm (nominal)
Solvents	Compatible with all organic solvents
pH Range	Stable between 1 and 14 under normal use conditions

Disk Vacuum Manifold System Setup



Disclaimer:

All statements, technical information and recommendations herein are based on our tests we believe to be reliable, but the accuracy of completeness thereof is not guaranteed. Before using or specifying the product, user shall determine the suitability of the product for intended use. All questions of warranty and liability relating to this product are governed by the terms of the sale subject where applicable to the prevailing law.

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