Empore™

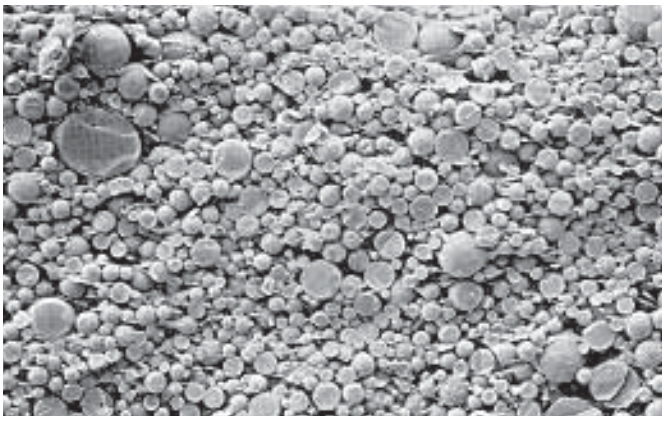
Solid Phase Extraction Disks

Cation Exchange

General Information

Empore™ Solid Phase Extraction (SPE) Disks provide an efficient alternative to liquid/liquid extraction for sample preparation. 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 SPE 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 solid phase extraction disk.



High Density (HD) Empore™ Membrane (10-12 µm particle size)

Product Information

Ion exchange solid phase extraction is a procedure for extracting ionized species from liquid samples. Empore™ Cation Exchange - SR Disks are suggested for the extraction and recovery of primary, secondary and some tertiary amines as well as most metal cations from aqueous solutions. Because the benzene sulfonic acid functional group is a strong ion exchanger, the Empore cation exchange disks are not recommended for quaternary amines.

Suggested Product Applications

Sorbent	Suggested Applications	Product Number	
		47 mm	90 mm
Cation exchange	Metals, amines, positively charged analytes	2251	NA

CDS Analytical

Extraction Method with Cation Exchange Disk

Step A: Sample Preparation

- Adjust sample pH as neccessary to ensure that analytes are ionic. (Lower sample pH at least 2 units below the pK_a of the analytes being extracted.)
- Dilute sample as needed to reduce ionic strength to < 0.005 M.
- Filter Aid 400 and/or prefiltration may be helpful if the sample contains excessive suspended solids.

Step B: Extraction Disk Conditioning

Disk conditioning is critical for a successful extraction. Conditioning provides a good interface between the sorbent and the sample matrix. **Failure to condition the extraction disks properly will result in erratic and low recoveries.**

1. Center the extraction disk on the base of the filtration apparatus and clamp the reservoir on top of the disk.*
2. Wash the disk with 10 or 15 mL* of acetone, allow to soak for 30 seconds and evacuate to dryness (optional).
3. Wet the disk with 10 or 15 mL* methanol, allow to soak for 30 seconds and evacuate to dryness (optional).
4. Add 10 or 50 mL* of reagent water, allow to soak for 30 seconds, and evacuate.
5. Add 10 or 15 mL* of 50% (v/v) HNO_3 to the disk, allow to soak for 30 seconds, and evacuate.
6. Wash disk with 2 successive 20 mL aliquots of reagent water. (Use 2 successive 10 mL aliquots of acetone if the sample matrix is non-aqueous).

*Note: Suggested solvent volumes will vary according to the disk diameter and the amount of Filter Aid 400/filter material. A general guide for solvent volumes is to completely cover the disk and bed of filter material, such that 2-3 mm of solvent is above the surface. Repeat with second aliquot.

Step C: Sample Extraction

- Dilute the sample as necessary to keep ionic strength <0.1 M (1 liter maximum sample size).
- Pour the sample into the reservoir and apply full vacuum. Recoveries are not affected by flow rate. Flow rate is dependent on vacuum source and particulate content of the sample.
- After sample extraction is complete, remove as much residual water as possible from the disk by applying vacuum to dry the disk for 5-20 minutes.

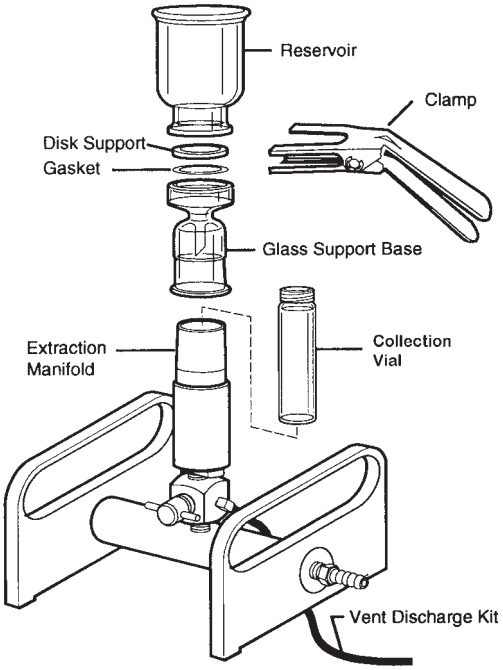
Step D: Sample Elution

Eluting twice with 10 or 15 mL* solvent is recommended. (Use 10 mL of solvent for 47 mm disks and 20 mL of solvent for 90 mm disks). Smaller volumes of solvent may be used if the elution technique has been perfected. Elution is often encouraged by the selection of high selectivity counterion, high ionic strength, and a pH adjusted to at least 2 units above the pKa of the analytes extracted. An effective elution solvent for metals is 50% (v/v) HNO_3 and 0.01N NaOH. Acidified methanol or acetonitrile are effective elution solvents for non-metal analytes. Very strong bases such as quaternary amines may be difficult to elute from cation exchange disks.

- Place tip of filter base into the collection vessel (see diagram).
- Add 10 or 15 mL* elution solvent to sample container, rinsing down the sides. Transfer solvent from sample container in reservoir with a pipette, washing the walls of the reservoir in the process.
- Apply vacuum and pull approximately 1 mL elution solvent through the disk. Vent the vacuum and allow the disk to soak 30-60 seconds before applying vacuum to dry the disk.
- Repeat above process with a second aliquot of eluting solvent.
- A third aliquot of elution solvent may be used as a final rinse of the reservoir and disk to enhance recoveries.
- An intermediate wash with methanol or another organic solvent will remove neutral organics. Electrostatic forces will not be disturbed by this step. If all liquid has left the surface of the disk, a pre-wet with a minimum amount of methanol may be helpful to overcome surface tension effects. Simply wet the disk with enough methanol to cover the surface, then add the elution solvent.

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

Disk Manifold System Setup



Volume Guidelines

The small bed mass of sorbent in the Empore™ membrane allows for the use of smaller solvent volumes compared with traditional SPE products. A general guide to solvent volumes for a disk SPE method using cation exchange is listed in the table below.

Each assay will need some further optimization in terms of selecting the best elution solvent (commonly methylene chloride, methanol or acetonitrile).

EPA Methods will require specific reagents; please refer to those methods when using the Empore Disks for agency reporting.

Volume Guidelines: Cation Exchange

Step	Solvent	47 mm disk	90 mm disk
Condition	Methanol	10-15 mL	20-30 mL
Optional:	Reagent water	10-50 mL	20-100 mL
Aqueous	Sample solution	100-1000 mL	500-2000 mL
Elute	Eluting solution	10-15 mL	20-30 mL

Note: Suggested solvent volumes will vary according to the disk diameter, the amount of filter aid material, the analyte, the analyte's affinity for the chosen sorbent, and the strength of the eluting solvent. A general guide for solvent volumes is to completely cover the disk and bed of filter aid, such that 2-3 mm of solvent is above the top surface.

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 @ 20 inHg (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

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Note: Empore Solid Phase Extraction Products are intended for solid phase extraction during scientific research only. These products are not intended for use in medical devices or in assessment and treatment of clinical patients.

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