

*Solid Phase Extraction (DigiSEP SPE) is a novel technique to isolate and concentrate desired analytes from complex matrices. DigiSEP provides an effective and innovative solution to improve detection limits of elements through pre-concentration, or alternatively, to remove interfering matrices prior to ICP-OES and ICP-MS analysis.*

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## Solid Phase Extraction

SPE (Solid Phase Extraction) is a technique whereby a desired analyte, a cation or an anion, is concentrated and separated from a complex sample matrix onto a sorbent stationary phase. The interfering matrix, which is not retained, is effectively eliminated. As a result, the analyte can be analyzed at the best possible sensitivity range of the analytical technique, e.g. Inductively Coupled Plasma-Optical Emission Spectroscopy (ICP-OES), without the risk of matrix interference.

In recent years another technique has become very popular, the technique of Matrix Component Retention. In this case, the sorbent is selected to retain unwanted components in the matrix and the analytes of interest are not retained. Again, because the potentially interfering components have been removed, better sensitivity is obtained in sample analysis. This technique is seen most often in the food industry.

In both cases, the sorbent is placed in cartridges or liquid chromatography columns that can hold varying quantities of unprocessed samples.

In general, the SPE method should follow 4 steps:

Step One: **Conditioning** - The sorbent is prepared for the sample.

Step Two: **Retention** - Filter the desired analyte(s) or the unwanted matrix components.

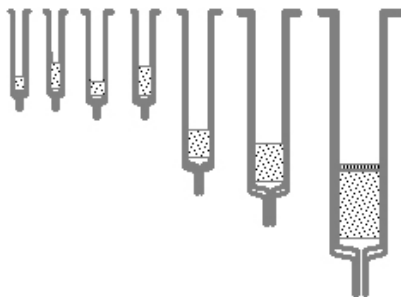
Step Three: **Rinsing** - Any possible undesired component that may have been absorbed on the sorbent is washed away.

Step Four: **Elution** - The selective desorption and collection of the analyte of interest from the cartridge or column.



### The Bed Volume and the Retention Capacity

To use the SPE method effectively, choose the cartridge or column volume and the appropriate sorbent type and mass for the analyte of interest. Normally the total retention capacity (including interferences) of the cartridge or column is approximately 5% of the sorbent mass.



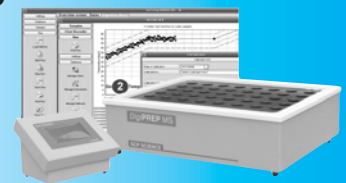
### Applications

- Sample preparation for the analysis of heavy metals in ground water
- Removal of matrix from food and feed digests for improved transition metal element analysis
- Removal of matrix from blood and serum digests for improved heavy metal element analysis
- Concentration and desalination for the analysis of seawater samples
- Enhance the sensitivity of XRF for water samples through SPE preconcentration
- Reduce the weight of water sample transportation (carry only collected samples in cartridges)

## DigiPREP MS - Sample Preparation for Metal Analysis

Delivers uniform heating across the block which provides even sample digestion/evaporation results

- Teflon® Coated Graphite Block
  - Resists aggressive, corrosive attack
- Ideal for applications such as: water, soil, sludge and feed



## Solid Phase Extraction

### DigiSEP - Blue Label Metal Extraction Cartridges

A general purpose, single use, cation removal cartridge. This highly selective exchange cartridge is ideal for retaining transition metals in samples that contain high concentrations of potassium and sodium such as sea water.

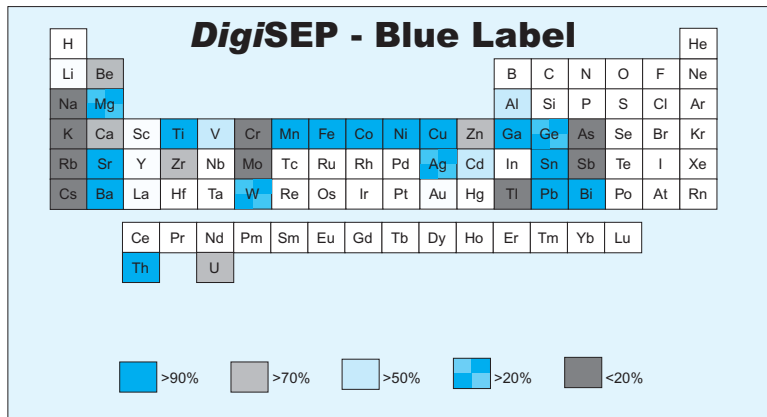
#### DigiSEP - Blue Label

Base Material	Functional Group	Capture (g)
Methacrylate	Amino di acetate	Cu ion 0.29 - 0.34 mmol / g

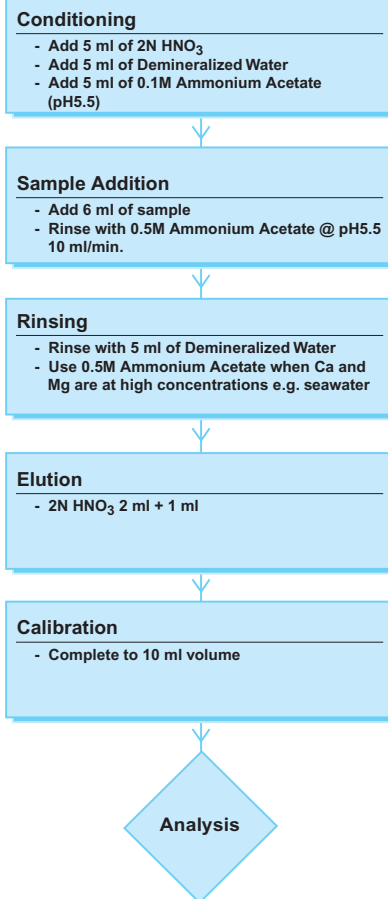
#### Ordering Information

Description	Particle (µm)	Surface (m <sup>2</sup> /g)	Quantity	Catalog Number
DigiSEP - Blue Label 100 mg / 3 ml	60 - 75	70 - 100	50 per box	010-700-010
DigiSEP - Blue Label 250 mg / 6 ml	60 - 75	70 - 100	25 per box	010-700-012
DigiSEP - Blue Label 500 mg / 6 ml	60 - 75	70 - 100	25 per box	010-700-014

Diagram 1: Metal Retention on DigiSEP - Blue Label Cartridge



#### DigiSEP - Blue Label Procedure for pre-concentration on Cation Cartridge



Solid Phase Extraction

### DigiSEP - Red Label Anion Extraction Cartridges

A general purpose, single use, anion removal cartridge.

#### DigiSEP - Red Label

Base Material	Functional Group	Capture (g)
Methacrylate	Ammonium NH <sub>4</sub> <sup>+</sup>	Anion 0.55 - 0.66 meq / g

#### Ordering Information

Description	Particle (µm)	Surface (m <sup>2</sup> /g)	Quantity	Catalog Number
DigiSEP - Red Label 100 mg / 3 ml	60 - 75	220 - 270	50 per box	010-700-026
DigiSEP - Red Label 250 mg / 6 ml	60 - 75	220 - 270	25 per box	010-700-028
DigiSEP - Red Label 500 mg / 6 ml	60 - 75	220 - 270	25 per box	010-700-030

## Solid Phase Extraction

### DigiSEP - Green Label Cation Removal Cartridges

A general purpose, single use, cation removal cartridge. This cartridge is best suited for samples that have low concentrations of alkali and alkaline earth metals.

#### DigiSEP - Green Label

Base Material	Functional Group	Capture (g)
Methacrylate	Sulfonate $\text{SO}_4^{2-}$	Cation 0.55 - 0.65 meq / g

#### Ordering Information

Description	Particle ( $\mu\text{m}$ )	Surface ( $\text{m}^2/\text{g}$ )	Quantity	Catalog Number
DigiSEP - Green Label 100 mg / 3 ml	60 - 75	90 - 110	50 per box	010-700-032
DigiSEP - Green Label 250 mg / 6 ml	60 - 75	90 - 110	25 per box	010-700-034
DigiSEP - Green Label 500 mg / 6 ml	60 - 75	90 - 110	25 per box	010-700-036



### DigiSEP - Orange Label Matrix Removal Cartridges

A general purpose, single use, matrix clean-up.

#### NOTE:

#### DigiSEP - Orange Label

Base Material	Functional Group	Capture (g)
SDB/Methacrylate	---	General Matrix Clean-up

Clean up for ICP-MS analysis. Effective for samples with high concentrations of matrix elements. As an example, clean-up SPE cartridges will efficiently remove high concentrations of Na, K, Ca, Mg in seawater enhancing the sensitivity of ICP-MS.

#### Ordering Information

Description	Particle ( $\mu\text{m}$ )	Surface ( $\text{m}^2/\text{g}$ )	Quantity	Catalog Number
DigiSEP - Orange Label 30 mg / 1 ml	60 - 75	620 - 660	100 per box	010-700-020
DigiSEP - Orange Label 60 mg / 3 ml	60 - 75	620 - 660	100 per box	010-700-022
DigiSEP - Orange Label 250 mg / 6 ml	60 - 75	620 - 660	25 per box	010-700-024
DigiSEP - Orange Label Mini 230 mg	46 - 52	620 - 660	50 per box	010-700-038



Catalog No. 010-700-038

### DigiSEP Molecular Recognition Technology Gel

Sample preparation and complex matrices represent two of the greatest challenges in Atomic Spectroscopy.

In the first case, if the samples are not prepared, i.e. digested and pre-treated prior to analysis, the data obtained can be meaningless. In the second case, if the matrices are composed of a complex mixture of salts, viscous acids and/or particulates, it may be next to impossible to detect very low levels of metals.

SCP SCIENCE can now help the Atomic Spectroscopist with both of these problems. We have seen in the previous chapter by carefully monitoring and controlling sample temperature, the digested metal recoveries can be improved. However, the problem of complex matrices remains a real hurdle in the analysis of metals by Atomic Spectroscopy; independent of whether it is Atomic Absorption-Graphite Furnace (GFAA), Inductively Coupled - Atomic Emission or Mass Spectroscopy.

**DigiSEP Molecular Recognition Technology Gel**

The solution to elemental analysis in complex matrices comes in the form of sample preparation using *DigiSEP* Cartridges. Highly selective (MRT: Molecular Recognition Technology) gel is ideal for Alkali and Alkaline Earth Metals, Precious metals, Cr (exclusively), and Hg (exclusively) retention. *DigiSEP* Cartridges can also be used to remove NO<sub>3</sub><sup>-</sup>, SO<sub>4</sub><sup>-</sup>, and Cl<sup>-</sup> ions from a sample matrix. In addition, new MRTs are in development.

Some of the key features of *DigiSEP* Cartridges are:

- Chelating Resins can separate difficult to analyse transition metals from high Alkali matrices
- Metal ions can be collected from acid digestion matrices
- Heavy metals can be separated from oil and other organic matrices
- Hg can be captured, collected, and concentrated
- Precious metals can be collected and retained
- Pb can be collected and separated from other elements
- Radioactive elements can be collected for nuclear fuel industry

The Binding Resins are on a Silica Gel base and can be regenerated between uses. The product is available in cartridge form (3 ml/500mg), in 50 and 100 mm x 4.6 mm PEEK body liquid chromatography columns and powder form in bottles of 10 grams.

Solid Phase  
Extraction

**Application Guide**

**Table 1. Alkali and Alkaline Earth Metals**

The presence of large quantities (above 1%) of Alkali and Alkaline elements causes a matrix interference in the analysis of transition metals. The AM and AE series of cartridges allow selective removal of these interfering elements.

**Specifications**

Product Type	Target Analyte	Matrix	Range (pH)	Optimal Flow Rate (ml/g/minute)	Remarks
<i>DigiSEP</i> AM-01	Ca <sup>2+</sup> , Na <sup>+</sup>	Water	2.0 - 10.0	---	Water, EDTA, elutable
<i>DigiSEP</i> AM-02	Ca <sup>2+</sup> , Na <sup>+</sup>	Water	> 6.0	---	acid elutable
<i>DigiSEP</i> AM-03	Na <sup>+</sup> , K <sup>+</sup> , Rb <sup>+</sup> , Ca <sup>2+</sup> , Sr <sup>2+</sup> , Ba <sup>2+</sup> (Mg <sup>2+</sup> , Li <sup>+</sup> , weakly)	Water	2.0 - 10.0	---	Water, EDTA, elutable
<i>DigiSEP</i> AM-04	K <sup>+</sup> , Na <sup>+</sup> , Rb <sup>+</sup> , Ca <sup>2+</sup> , Sr <sup>2+</sup>	Water	> 6.0	---	Acid elutable
<i>DigiSEP</i> AM-05	Li <sup>+</sup>	Water	> 6.0	---	Acid elutable
<i>DigiSEP</i> AM-06	Ba <sup>2+</sup> , Pb <sup>2+</sup> , Tl <sup>+</sup> , Sr <sup>2+</sup> , K <sup>+</sup>	Water	> 6.0	---	Acid elutable
<i>DigiSEP</i> AE-01	Ca <sup>2+</sup> , Mg <sup>2+</sup> , other +2 and +3 cations	Water	> 5.0	---	Acid elutable
<i>DigiSEP</i> AE-02	Ca <sup>2+</sup>	Water	> 6.0	---	Acid elutable
<i>DigiSEP</i> AE-03	All alkali and alkaline earths except Li <sup>+</sup> , Mg <sup>2+</sup> , Ba <sup>2+</sup>	Water	2.0 - 10.0	---	Water, EDTA, elutable
<i>DigiSEP</i> AE-04	Sr <sup>2+</sup> , Ca <sup>2+</sup> , Ba <sup>2+</sup> , Na <sup>+</sup> , K <sup>+</sup> , Cs <sup>+</sup>	Water	2.0 - 10.0	---	Water, EDTA, elutable

**Ordering Information**

Product Type	Columns (each)		Cartridge (5/pk)	Powder (10 g)
	4.6 x 50 mm	4.6 x 100 mm		
<i>DigiSEP</i> AM-01	010-750-095	010-751-095	010-720-095	010-790-095
<i>DigiSEP</i> AM-02	010-750-097	010-751-097	010-720-097	010-790-097
<i>DigiSEP</i> AM-03	010-750-099	010-751-099	010-720-099	010-790-099
<i>DigiSEP</i> AM-04	010-750-101	010-751-101	010-720-101	010-790-101
<i>DigiSEP</i> AM-05	010-750-103	010-751-103	010-720-103	010-790-103
<i>DigiSEP</i> AM-06	010-750-105	010-751-105	010-720-105	010-790-105
<i>DigiSEP</i> AE-01	010-750-107	010-751-107	010-720-107	010-790-107
<i>DigiSEP</i> AE-02	010-750-109	010-751-109	010-720-109	010-790-109
<i>DigiSEP</i> AE-03	010-750-111	010-751-111	010-720-111	010-790-111
<i>DigiSEP</i> AE-04	010-750-113	010-751-113	010-720-113	010-790-113

## Solid Phase Extraction

**Table 2. Anions and Halogens**

Sulfuric acid (H<sub>2</sub>SO<sub>4</sub>) is a powerful oxidizing acid and using the appropriate *DigiPREP* Digestion System (See Method Development Guide-pg 19), sulfuric acid can digest almost any organic matrix. However, it is extremely viscous even at low concentrations and requires long washout times through the ICP spray chamber. The AN-01 cartridge will avoid this problem.

At present, the only way to digest SiO<sub>2</sub> is to use an excess of HF (hydrofluoric acid) which creates problems with ICP spectroscopy. The resulting F<sup>-</sup> excess can precipitate elements of interest such as Mg and Al. In the past, Boric Acid has been added to the complex remaining F<sup>-</sup> ions. However, this solution results in a more complex matrix increasing the analytical difficulty. Now with the *DigiSEP* F-01 and F-02 cartridges, the excess F<sup>-</sup> ions can be removed.

### Specifications

Product Type	Target Analyte	Matrix	Range (pH)	Optimal Flow Rate (ml/g/minute)	Remarks
<i>DigiSEP</i> AN-01	SO <sub>4</sub> <sup>2-</sup> , SeO <sub>4</sub> <sup>2-</sup> , >SeO <sub>3</sub> <sup>2-</sup> , >NO <sub>3</sub> <sup>-</sup> , >Cl <sup>-</sup>	mM (acid)	< 3.0	---	Base elutable
<i>DigiSEP</i> AN-02	SO <sub>4</sub> <sup>2-</sup> , SeO <sub>4</sub> <sup>2-</sup> , >SeO <sub>3</sub> <sup>2-</sup> , >NO <sub>3</sub> <sup>-</sup> , >Cl <sup>-</sup>	water	< 10	---	Base elutable
<i>DigiSEP</i> Ha-01	Cl <sup>-</sup> , Br <sup>-</sup> , I <sup>-</sup>	HNO <sub>3</sub> , H <sub>2</sub> SO <sub>4</sub>	< 2.0	0.5	Removal of 100 ppb
<i>DigiSEP</i> F-01	F <sup>-</sup> , >SO <sub>4</sub> <sup>2-</sup> , >Cl <sup>-</sup>	Water	< 4	---	Base elutable
<i>DigiSEP</i> F-02	F <sup>-</sup>	Water	< 1 - 8	0.5	Base elutable

### Ordering Information

Product Type	Columns (each)		Cartridge (5/pkg)	Powder (10 g)
	4.6 x 50 mm	4.6 x 100 mm		
<i>DigiSEP</i> AN-01	010-750-001	010-751-001	010-720-001	010-790-001
<i>DigiSEP</i> AN-02	010-750-003	010-751-003	010-720-003	010-790-003
<i>DigiSEP</i> Ha-01	010-750-005	010-751-005	010-720-005	010-790-005
<i>DigiSEP</i> F-01	010-750-007	010-751-007	010-720-007	010-790-007
<i>DigiSEP</i> F-02	010-750-009	010-751-009	010-720-009	010-790-009

**Table 3. Toxic Metals**

The most toxic form of Chromium is the Cr<sup>6+</sup> form. However, ICP-AES can only determine the total amount of Chromium. Now with the Cr series cartridges, the more toxic form can be effectively isolated and then analyzed.

The benefit of today's modern Hg analysers is improved detection limits for this toxic and elusive metal. However, improved detection limits are hampered by base line stability problems. Through pre-concentration and matrix removal, improved sensitivities for Hg can be obtained. The Hg-01 to 03 cartridges provide this benefit.

### Specifications

Product Type	Target Analyte	Matrix	Range (pH)	Optimal Flow Rate (ml/g/minute)	Remarks
<i>DigiSEP</i> Cd-01	Cd <sup>2+</sup>	Waste Water	2 - 9.5	0.5	Removal 1 ppb
<i>DigiSEP</i> Cr-01	CrO <sub>4</sub> <sup>2-</sup>	Waste Water	---	---	---
<i>DigiSEP</i> Cr-02	CrO <sub>4</sub> <sup>2-</sup>	Waste Water	2.0 - 8.0	---	---
<i>DigiSEP</i> Hg-01	Hg <sup>2+</sup>	Drinking Water	---	---	Thiourea or HBr elutable
<i>DigiSEP</i> Hg-02	Hg <sup>2+</sup>	Salt Water (Sea	---	0.5	< 20 ppt; thiourea elutable
<i>DigiSEP</i> Hg-03	Hg <sup>2+</sup>	water)	6.5 - 9.5	---	removal of 20 ppt
<i>DigiSEP</i> Pb-01	Pb <sup>2+</sup>	Water	1 - 9.5	0.5	removal of 5 ppb
<i>DigiSEP</i> Pb-02	Pb <sup>2+</sup> (>Pb-01)	Water	1 - 9.5	0.5	removal of 20 ppt
<i>DigiSEP</i> Pb-03	Pb <sup>2+</sup> (>Pb-02)	Water	6.5 - 9.5	0.5	Acid elutable, removal of 10 ppt
<i>DigiSEP</i> Pb-04	Pb <sup>2+</sup>	Water	7.0 - 9.5	---	Acid elutable, removal of 100 - 1000 ppt

Ordering Information - continued

Product Type	Columns (each)		Cartridge (5/pk)	Powder (10 g)
	4.6 x 50 mm	4.6 x 100 mm		
DigiSEP Cd-01	010-750-011	010-751-011	010-720-011	010-790-011
DigiSEP Cr-01	010-750-013	010-751-013	010-720-013	010-790-013
DigiSEP Cr-02	010-750-015	010-751-015	010-720-015	010-790-015
DigiSEP Hg-01	010-750-017	010-751-017	010-720-017	010-790-017
DigiSEP Hg-02	010-750-019	010-751-019	010-720-019	010-790-019
DigiSEP Hg-03	010-750-021	010-751-021	010-720-021	010-790-021
DigiSEP Pb-01	010-750-023	010-751-023	010-720-023	010-790-023
DigiSEP Pb-02	010-750-025	010-751-025	010-720-025	010-790-025
DigiSEP Pb-03	010-750-027	010-751-027	010-720-027	010-790-027
DigiSEP Pb-04	010-750-029	010-751-029	010-720-029	010-790-029

Table 4. Precious Metals

The mining industry is constantly on the search for precious metals. Rock samples require grinding and then digestion by the appropriate DigiPREP Digestion System (See Method Development Guide pg 19). However, precious metals are found in limited quantities versus other metals in the same sample. Hence, their analysis may be more difficult. The PM series DigiSEP Cartridges will retain and concentrate precious metals. The metals can then be eluted and analyzed at higher concentrations in the absence of interferences.

Specifications

Product Type	Target Analyte	Matrix	Range (pH)	Optimal Flow Rate (ml/g/minute)	Remarks
DigiSEP Pd-01	Pd <sup>2+</sup>	---	---	---	---
DigiSEP Pd-02	Pd <sup>2+</sup>	---	---	---	---
DigiSEP Pd-03	Pd <sup>2+</sup>	Minimum 6 M HCl	< 1 - 4.0	---	---
DigiSEP PM-01	Ir <sup>3+</sup> , Ru <sup>3+</sup> , and/or Rh <sup>3+</sup>	Minimum 6 M HCl	---	0.5	---
DigiSEP PM-02	Au <sup>3+</sup> , Ag <sup>1+</sup> , Pd <sup>2+</sup> , Pt <sup>2+</sup> , Pt <sup>4+</sup> , Ru <sup>3+</sup>	Minimum 6 M HCl	< 1 - 9.5	---	---
DigiSEP PM-03	Pd <sup>2+</sup> , Pd <sup>4+</sup> (>Pm-05)	Minimum 6 M HCl	< 1 - 4	---	Thiourea elutable
DigiSEP PM-05	Pd <sup>2+</sup> , Pd <sup>4+</sup>	Minimum 6 M HCl	< 1 - 4	0.5	NH <sub>3</sub> elutable
DigiSEP PM-06	Pd <sup>2+</sup> , Pt <sup>2+</sup>	---	< 1 - 9.5	0.5	---
DigiSEP PM-07	Au <sup>3+</sup> , Ag <sup>1+</sup> , Pd <sup>2+</sup> , Pt <sup>2+</sup> , Pt <sup>4+</sup> , Ru <sup>3+</sup> (>Pm-02)	Minimum 6 M HCl	---	---	---
DigiSEP PM-08	Ir <sup>3+</sup> , Rh <sup>3+</sup> , and Ru <sup>3+</sup>	Minimum 6 M HCl	1 - 9.5	0.5	selectively elutable
DigiSEP PM-09	Au <sup>3+</sup> , Pt <sup>2+</sup> , Pt <sup>4+</sup> , Pd <sup>2+</sup>	Minimum 6 M HCl	1 - 9.5	0.5	selectively elutable
DigiSEP PM-10	Ir <sup>3+</sup> , Ru, and/or Rh <sup>3+</sup>	Minimum 6 M HCl	< 1.0	---	---

Ordering Information

Product Type	Columns (each)		Cartridge (5/pk)	Powder (10 g)
	4.6 x 50 mm	4.6 x 100 mm		
DigiSEP Pd-01	010-750-031	010-751-031	010-720-031	010-790-031
DigiSEP Pd-02	010-750-033	010-751-033	010-720-033	010-790-033
DigiSEP Pd-03	010-750-035	010-751-035	010-720-035	010-790-035
DigiSEP PM-01	010-750-037	010-751-037	010-720-037	010-790-037
DigiSEP PM-02	010-750-039	010-751-039	010-720-039	010-790-039
DigiSEP PM-03	010-750-041	010-751-041	010-720-041	010-790-041
DigiSEP PM-05	010-750-045	010-751-045	010-720-045	010-790-045
DigiSEP PM-06	010-750-047	010-751-047	010-720-047	010-790-047
DigiSEP PM-07	010-750-049	010-751-049	010-720-049	010-790-049
DigiSEP PM-08	010-750-051	010-751-051	010-720-051	010-790-051
DigiSEP PM-09	010-750-053	010-751-053	010-720-053	010-790-053
DigiSEP PM-10	010-750-055	010-751-055	010-720-055	010-790-055

## Solid Phase Extraction

**Table 5. Transition Metals**

Transition metals can represent a challenge in ICP analysis. These important metals can be retained on TE cartridges separating them from other interfering elements. The eluted transition metals can then be analyzed without the original matrix interferences.

### Specifications

Product Type	Target Analyte	Matrix	Range (pH)	Optimal Flow Rate (ml/g/minute)	Remarks
DigiSEP TE-01	Ag <sup>1+</sup> , Au <sup>3+</sup> , Cd <sup>2+</sup> , Co <sup>2+</sup> , Cu <sup>2+</sup> , Fe <sup>2+</sup> , Hg <sup>2+</sup> , Ni <sup>2+</sup> , Pb <sup>2+</sup> , Pd <sup>2+</sup> , Zn <sup>2+</sup>	Water	4 - 9.5	0.5	acid elutable, > 1 ppm
DigiSEP TE-02	Ag <sup>1+</sup> , Au <sup>3+</sup> , Cd <sup>2+</sup> , Co <sup>2+</sup> , Cu <sup>2+</sup> , Fe <sup>2+</sup> , Hg <sup>2+</sup> , Ni <sup>2+</sup> , Pb <sup>2+</sup> , Pd <sup>2+</sup> , Zn <sup>2+</sup> , Fe <sup>3+</sup> , Mn <sup>2+</sup>	Water	4 - 9.5	0.5	6 M HCl elutable, > 0.1 ppm
DigiSEP TE-03	Au <sup>3+</sup> , Co <sup>2+</sup> , Cu <sup>2+</sup> , Hg <sup>2+</sup> , Fe <sup>3+</sup> , Pd <sup>2+</sup> , Zn <sup>2+</sup> (all pH range). Ag <sup>1+</sup> , Cd <sup>2+</sup> , Pb <sup>2+</sup> , (pH>3), Cu <sup>2+</sup> (pH<3)	Water	1 - 9.5	0.5	EDTA, 6 M elutable; < 100 ppb
DigiSEP TE-04	Au <sup>3+</sup> , Co <sup>2+</sup> , Cu <sup>2+</sup> , Hg <sup>2+</sup> , Ni <sup>2+</sup> , Pd <sup>2+</sup> , Zn <sup>2+</sup> (all pH range). Ag <sup>1+</sup> , Cd <sup>2+</sup> , Pb <sup>2+</sup> , (pH>3), Cu <sup>2+</sup> (pH<3)	Water	1 - 9.5	0.5	EDTA, 6 M elutable; < 100 ppb
DigiSEP TE-05	Fe <sup>3+</sup> , Co <sup>3+</sup> , Cu <sup>2+</sup> , Hg <sup>2+</sup> , Ni <sup>2+</sup> , Pd <sup>2+</sup> , Zn <sup>2+</sup> (all pH range), Mn <sup>2+</sup> , Cd <sup>2+</sup> , Zn <sup>2+</sup> and Pb <sup>2+</sup> (pH>3)	Water	1 - 9.5	0.5	Acid elutable
DigiSEP TE-06	Cu <sup>2+</sup>	Water	2.0 - 9.5	0.5	Acid elutable
DigiSEP TE-07	Most +2, +3 and +4 metal ions as a group	Water	> 2.0	---	6 M HCl elutable
DigiSEP TE-09	Au <sup>3+</sup> , Pb <sup>2+</sup> , Hg <sup>2+</sup> , Pd <sup>2+</sup> , Ag <sup>2+</sup>	Water	---	---	---
DigiSEP TE-10	Cu <sup>2+</sup> , Ni <sup>2+</sup> , Co <sup>2+</sup> , Zn <sup>2+</sup>	Water	0.5 - 3.0	---	6 M HCl elutable
DigiSEP TE-11	Ni <sup>2+</sup> , Co <sup>2+</sup> , Cu <sup>2+</sup> , Zn <sup>2+</sup>	Water	0.5 - 2.0	---	6 M HCl elutable
DigiSEP TE-12	Ni <sup>2+</sup> , Co <sup>2+</sup> , Cu <sup>2+</sup> , Zn <sup>2+</sup>	Water	0.5 - 2.0	---	6 M HCl elutable
DigiSEP TE-13	Ge <sup>2+</sup> , Sn <sup>4+</sup> , MoO <sub>4</sub> <sup>2-</sup> , borate as a group	Multiple	1 - 12	---	HCl elutable

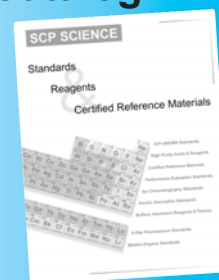
### Ordering Information

Product Type	Columns (each) 4.6 x 50 mm	Columns (each) 4.6 x 100 mm	Cartridge (5/pk)	Powder (10 g)
DigiSEP TE-01	010-750-071	010-751-071	010-720-071	010-790-071
DigiSEP TE-02	010-750-073	010-751-073	010-720-073	010-790-073
DigiSEP TE-03	010-750-075	010-751-075	010-720-075	010-790-075
DigiSEP TE-04	010-750-077	010-751-077	010-720-077	010-790-077
DigiSEP TE-05	010-750-079	010-751-079	010-720-079	010-790-079
DigiSEP TE-06	010-750-081	010-751-081	010-720-081	010-790-081
DigiSEP TE-07	010-750-083	010-751-083	010-720-083	010-790-083
DigiSEP TE-09	010-750-085	010-751-085	010-720-085	010-790-085
DigiSEP TE-10	010-750-087	010-751-087	010-720-087	010-790-087
DigiSEP TE-11	010-750-089	010-751-089	010-720-089	010-790-089
DigiSEP TE-12	010-750-091	010-751-091	010-720-091	010-790-091
DigiSEP TE-13	010-750-093	010-751-093	010-720-093	010-790-093

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Catalog No. 140-000-005

**Table 6. Radioactive Nucliotides**

The potential of teeth as a biological indicator of <sup>90</sup>Sr<sup>2+</sup> accumulation in the body has been pointed out since the early 1950's. The *DigiSEP* Sr-01 cartridges can be used to isolate Sr<sup>2+</sup> from the digested tooth sample.

**Specifications**

Product Type	Target Analyte	Matrix	Range (pH)	Optimal Flow Rate (ml/g/minute)	Remarks
<i>DigiSEP</i> Pu-01	Pu <sup>3+</sup>	> 2 M Acid	< 1 - 9.5	---	6 M HCl elutable
<i>DigiSEP</i> Pu-02	Pu <sup>3+</sup>	2 M acid	1.0 - 9.5	---	> 6 M HCl elutable
<i>DigiSEP</i> Sr-01	Sr <sup>2+</sup>	Waste Water	1 - 10.0	0.5	EDTA eluted
<i>DigiSEP</i> Cs-01	Cs <sup>+</sup>	Water	< 0 - 9.5	---	removal to 500 ppt
<i>DigiSEP</i> Tc-01	TcO <sub>4</sub> <sup>-</sup>	---	1 - 14	0.1	---
<i>DigiSEP</i> Tc-02	TcO <sub>4</sub> <sup>-</sup>	1 MH <sup>+</sup> or 0.1 M Na <sup>+</sup> or 0.01 MK <sup>+</sup>	1 - 14	0.1	---
<i>DigiSEP</i> Ra-01	Ra <sup>2+</sup>	Water	< 0 - 9.5	< 0 - 9.5	EDTA elutable

**Ordering Information**

Product Type	Columns (each)		Cartridge (5/pk)	Powder (10 g)
	4.6 x 50 mm	4.6 x 100 mm		
<i>DigiSEP</i> Pu-01	010-750-057	010-751-057	010-720-057	010-790-057
<i>DigiSEP</i> Pu-02	010-750-059	010-751-059	010-720-059	010-790-059
<i>DigiSEP</i> Sr-01	010-750-061	010-751-061	010-720-061	010-790-061
<i>DigiSEP</i> Cs-01	010-750-063	010-751-063	010-720-063	010-790-063
<i>DigiSEP</i> Tc-01	010-750-065	010-751-065	010-720-065	010-790-065
<i>DigiSEP</i> Tc-02	010-750-067	010-751-067	010-720-067	010-790-067
<i>DigiSEP</i> Ra-01	010-750-069	010-751-069	010-720-069	010-790-069

Solid Phase  
Extraction

***DigiSEP* IC-Ion Chromatography Columns**

**Ordering Information**

Product Type	Application	Size	Catalog Number
<i>DigiSEP</i> IC-1	Br, I, Cr	4.6 x 100 mm	010-700-044
<i>DigiSEP</i> IC-2	As	4.6 x 150 mm	010-700-046
<i>DigiSEP</i> IC-3	Se	4.6 x 150 mm	010-700-048
<i>DigiSEP</i> IC-4	Normal Ion Chromatography	4.6 x 100 mm	010-700-050
<i>DigiSEP</i> IC-G	Guard Column	4.6 x 10 mm	010-700-052

**Cross Referencing**

Product Type	Dionex®	Metrohm®	Agilent®
<i>DigiSEP</i> IC-1	Ion Pac AS14A / IC-Pac A25S	IC 1H-424 / IC SI-90	---
<i>DigiSEP</i> IC-2	---	---	G3154-65001
<i>DigiSEP</i> IC-3	IonPac AS14S / IC-Pac A25S	IC 1H-424 / IC SI-90	---
<i>DigiSEP</i> IC-4	---	IC NI-424	---
<i>DigiSEP</i> IC-G	---	---	---

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## Solid Phase Extraction

### DigiSEP Reagents

Reagents	Description	Concentration	Code	Catalog Number		
				500 ml	1 L	5 L
Ammonium Acetate	CH <sub>3</sub> COONH <sub>4</sub>	2 M		250-220-145	250-220-146	250-220-147
Nitric Acid	HNO <sub>3</sub>	2 N	✓ ⑧	250-035-250	250-035-251	250-035-252
Water, Deionized, ASTM Type I	H <sub>2</sub> O	18 Megohm/cm		---	---	250-310-820

#### Coming Soon:

High purity Ammonium Acetate. No clean up required. Buffer has been prepared through ion exchange to facilitate immediate use.

### DigiSEP Accessories



Description	Quantity	Catalog Number
SPE Vacuum Manifold Set	each	010-790-501
Excess Liquid Collection Vessel with Pump Tubing	2/pkg	010-790-503
Teflon® Luer Stop Cocks	10/pkg	010-790-505
SPE Cartridge Adaptor	5/pkg	010-790-507
Vacuum Pump	1	010-790-509
Borosilicate Tube with screw caps at both ends For making your own cartridges	1	010-790-511
Polypropylene Frit 10 µm pore size	2	010-790-513
12 Place Rack (12 position)	1	010-510-050



\* Not exactly as shown

⊗ Glass Container  
✓ Dangerous Goods\*

⑥ Poison  
⑧ Corrosive

③ Flammable  
⑤ Oxidant

\* as defined by :

\* Hazardous Materials Regulations of the U.S. Department of Transportation, Tariff No. BOE-6000-R  
\* Canadian Transportation of Dangerous Goods Act and Regulations, Revision December 2000  
\* International Air Transport Association - Dangerous Goods Regulation, 40th Edition

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- Calibration standards (ex. single, multi, custom blends)

