*Solid Phase Extraction (Digi***SEP** *SPE) is a novel technique to isolate and concentrate desired analytes from complex matrices. Digi***SEP** *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.*

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 possiblesensitivity 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.

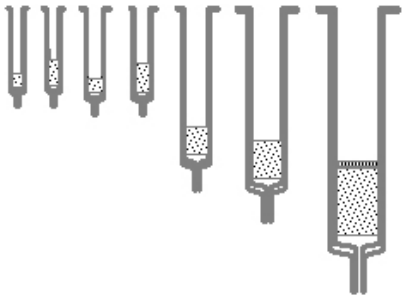
Step Two: **Retention** - Filter the desired analyte(s) or the unwanted matrix components.

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 effectivily, choose the cartridge or column volume and the appropriate sorbent type and mass for the analyte of interest. Normally the total retention capacity (including interferents) of the cartridge or column is approximately 5% of the sorbent mass.



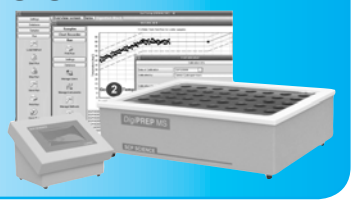
Applications

- 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)

*Digi*PREP 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



*Digi*SEP - 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.

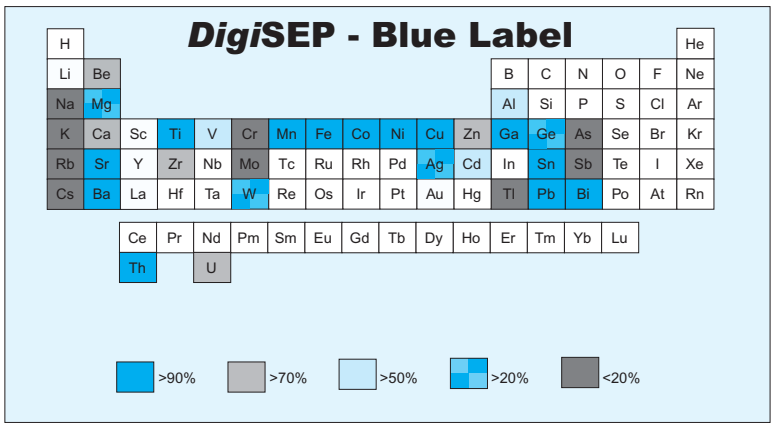
*Digi*SEP - Blue Label

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^2/g)	Quantity	Catalog Number
***Digi*SEP - Blue Label 100 mg / 3 ml**	60 - 75	70 - 100	50 per box	010-700-010
***Digi*SEP - Blue Label 250 mg / 6 ml**	60 - 75	70 - 100	25 per box	010-700-012
***Digi*SEP - Blue Label 500 mg / 6 ml**	60 - 75	70 - 100	25 per box	010-700-014

Diagram 1: Metal Retention on *Digi*SEP - Blue Label Cartridge



***Digi*SEP - Blue Label**
Procedure for pre-concentration on Cation Cartridge

Conditioning
- Add 5 ml of 2N HNO_3
- Add 5 ml of Demineralized Water
- Add 5 ml of 0.1M Ammonium Acetate (pH5.5)

Sample Addition
- Add 6 ml of sample
- Rinse with 0.5M Ammonium Acetate @ pH5.5 10 ml/min.

Rinsing
- Rinse with 5 ml of Demineralized Water
- Use 0.5M Ammonium Acetate when Ca and Mg are at high concentrations e.g. seawater

Elution
- 2N HNO_3 2 ml + 1 ml

Calibration
- Complete to 10 ml volume

Analysis

*Digi*SEP - 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_4^+	Anion 0.55 - 0.66 meq / g

Ordering Information

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

Solid Phase Extraction

*Digi*SEP - 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 akaline earth metals.

*Digi*SEP - Green Label

Base Material	Functional Group	Capture (g)
Methacrylate	Sulfonate SO_4^{2-}	Cation 0.55 - 0.65 meq / g

Ordering Information

Description	Particle (µm)	Surface (m^2/g)	Quantity	Catalog Number
*Digi*SEP - Green Label 100 mg / 3 ml	60 - 75	90 - 110	50 per box	010-700-032
*Digi*SEP - Green Label 250 mg / 6 ml	60 - 75	90 - 110	25 per box	010-700-034
*Digi*SEP - Green Label 500 mg / 6 ml	60 - 75	90 - 110	25 per box	010-700-036

*Digi*SEP - Orange Label — Matrix Removal Cartridges

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

*Digi*SEP - Orange Label

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

NOTE:

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 (µm)	Surface (m^2/g)	Quantity	Catalog Number
*Digi*SEP - Orange Label 30 mg / 1 ml	60 - 75	620 - 660	100 per box	010-700-020
*Digi*SEP - Orange Label 60 mg / 3 ml	60 - 75	620 - 660	100 per box	010-700-022
*Digi*SEP - Orange Label 250 mg / 6 ml	60 - 75	620 - 660	25 per box	010-700-024
*Digi*SEP - Orange Label Mini 230 mg	46 - 52	620 - 660	50 per box	010-700-038

Catalog No. 010-700-038

*Digi*SEP 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 maybe 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.

*Digi*SEP Molecular Recognition Technology Gel

The solution to elemental analysis in complex matrices comes in the form of sample preparation using *Digi***SEP** Cartridges. Highly selective (MRT: Molecular Recognition Technology) gel is ideal for Alkali and Alkaline Earth Metals, Precious metals, Cr (exclusively),and Hg (exclusively) retention. *Digi***SEP** Cartridges can also be used to remove NO_3^-, SO_4^-, and Cl^- ions from a sample matrix. In addition, new MRTs are in development.

Some of the key features of *Digi***SEP** 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.

Application Guide

Table 1. Alkali and Akaline 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
*Digi***SEP AM-01**	Ca^{2+}, Na^+	Water	2.0 - 10.0	---	Water, EDTA, elutable
*Digi***SEP AM-02**	Ca^{2+}, Na^+	Water	> 6.0	---	acid elutable
*Digi***SEP AM-03**	Na^+, K^+, Rb^+, Ca^{2+}, Sr^{2+}, Ba^{2+} (Mg^{2+}, Li^+, weakly)	Water	2.0 - 10.0	---	Water, EDTA, elutable
*Digi***SEP AM-04**	K^+, Na^+, Rb^+, Ca^{2+}, Sr^{2+}	Water	> 6.0	---	Acid elutable
*Digi***SEP AM-05**	Li^+	Water	> 6.0	---	Acid elutable
*Digi***SEP AM-06**	Ba^{2+}, Pb^{2+}, Tl^+, Sr^{2+}, K^+	Water	> 6.0	---	Acid elutable
*Digi***SEP AE-01**	Ca^{2+}, Mg^{2+}, other +2 and+3 cations	Water	> 5.0	---	Acid elutable
*Digi***SEP AE-02**	Ca^{2+}	Water	> 6.0	---	Acid elutable
*Digi***SEP AE-03**	All alkali and akaline earths except Li^+, Mg^{2+}, Ba^{2+}	Water	2.0 - 10.0	---	Water, EDTA, elutable
*Digi***SEP AE-04**	Sr^{2+}, Ca^{2+}, Ba^{2+}, Na^+, K^+, Cs^+	Water	2.0 - 10.0	---	Water, EDTA, elutable

Ordering Information

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

Table 2. Anions and Halogens

Sulfuric acid (H_2SO_4) is a powerful oxidizing acid and using the appropriate *Digi***PREP** 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_2 is to use an excess of HF (hydrofluoric acid) which creates problems with ICP spectroscopy. The resulting F^- excess can precipitate elements of interest such as Mg and Al. In the past, Boric Acid has been added to the complex remaining F^- ions. However, this solution results in a more complex matrix increasing the analytical difficulty. Now with the *Digi***SEP** F-01 and F-02 cartridges, the excess F^- ions can be removed.

Specifications

Product Type	Target Analyte	Matrix	Range (pH)	Optimal Flow Rate (ml/g/minute)	Remarks
*Digi***SEP AN-01**	SO_4^{2-}, SeO_4^{2-}, $>SeO_3^{2-}$, $>NO_3^-$, $>Cl^-$	mM (acid)	< 3.0	---	Base elutable
*Digi***SEP AN-02**	SO_4^{2-}, SeO_4^{2-}, $>SeO_3^{2-}$, $>NO_3^-$, $>Cl^-$	water	< 10	---	Base elutable
*Digi***SEP Ha-01**	Cl^-, Br^-, I^-	HNO_3, H_2SO_4	< 2.0	0.5	Removal of 100 ppb
*Digi***SEP F-01**	F^-, $>SO_4^{2-}$, $>Cl^-$	Water	< 4	---	Base elutable
*Digi***SEP F-02**	F^-	Water	< 1 - 8	0.5	Base elutable

Ordering Information

Product Type	Columns (each) 4.6 x 50 mm	4.6 x 100 mm	Cartridge (5/pk)	Powder (10 g)
*Digi***SEP AN-01**	010-750-001	010-751-001	010-720-001	010-790-001
*Digi***SEP AN-02**	010-750-003	010-751-003	010-720-003	010-790-003
*Digi***SEP Ha-01**	010-750-005	010-751-005	010-720-005	010-790-005
*Digi***SEP F-01**	010-750-007	010-751-007	010-720-007	010-790-007
*Digi***SEP 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^{6+} 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
*Digi***SEP Cd-01**	Cd^{2+}	Waste Water	2 - 9.5	0.5	Removal 1 ppb
*Digi***SEP Cr-01**	CrO_4^{2-}	Waste Water	---	---	---
*Digi***SEP Cr-02**	CrO_4^{2-}	Waste Water	2.0 - 8.0	---	---
*Digi***SEP Hg-01**	Hg^{2+}	Drinking Water	---	---	Thiourea or HBr elutable
*Digi***SEP Hg-02**	Hg^{2+}	Salt Water (Sea	---	0.5	< 20 ppt; thiourea elutable
*Digi***SEP Hg-03**	Hg^{2+}	water)	6.5 - 9.5	---	removal of 20 ppt
*Digi***SEP Pb-01**	Pb^{2+}	Water	1 - 9.5	0.5	removal of 5 ppb
*Digi***SEP Pb-02**	Pb^{2+} (>Pb-01)	Water	1 - 9.5	0.5	removal of 20 ppt
*Digi***SEP Pb-03**	Pb^{2+} (>Pb-02)	Water	6.5 - 9.5	0.5	Acid elutable, removal of 10 ppt
*Digi***SEP Pb-04**	Pb^{2+}	Water	7.0 - 9.5	---	Acid elutable, removal of 100 - 1000 ppt

Ordering Information - continued

Product Type	Columns (each) 4.6 x 50 mm	4.6 x 100 mm	Cartridge (5/pk)	Powder (10 g)
*Digi***SEP Cd-01**	010-750-011	010-751-011	010-720-011	010-790-011
*Digi***SEP Cr-01**	010-750-013	010-751-013	010-720-013	010-790-013
*Digi***SEP Cr-02**	010-750-015	010-751-015	010-720-015	010-790-015
*Digi***SEP Hg-01**	010-750-017	010-751-017	010-720-017	010-790-017
*Digi***SEP Hg-02**	010-750-019	010-751-019	010-720-019	010-790-019
*Digi***SEP Hg-03**	010-750-021	010-751-021	010-720-021	010-790-021
*Digi***SEP Pb-01**	010-750-023	010-751-023	010-720-023	010-790-023
*Digi***SEP Pb-02**	010-750-025	010-751-025	010-720-025	010-790-025
*Digi***SEP Pb-03**	010-750-027	010-751-027	010-720-027	010-790-027
*Digi***SEP 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 *Digi***PREP** 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 *Digi***SEP** 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
*Digi***SEP Pd-01**	Pd^{2+}	---	---	---	---
*Digi***SEP Pd-02**	Pd^{2+}	---	---	---	---
*Digi***SEP Pd-03**	Pd^{2+}	Minimum 6 M HCl	< 1 - 4.0	---	---
*Digi***SEP PM-01**	Ir^{3+}, Ru^{3+}, and/or Rh^{3+}	Minimum 6 M HCl	---	0.5	---
*Digi***SEP PM-02**	Au^{3+}, Ag^{1+}, Pd^{2+}, Pt^{2+}, Pt^{4+}, Ru^{3+}	Minimum 6 M HCl	< 1 - 9.5	---	---
*Digi***SEP PM-03**	Pd^{2+}, Pd^{4+} (>Pm-05)	Minimum 6 M HCl	< 1 - 4	---	Thiourea elutable
*Digi***SEP PM-05**	Pd^{2+}, Pd^{4+}	Minimum 6 M HCl	< 1 - 4	0.5	NH_3 elutable
*Digi***SEP PM-06**	Pd^{2+}, Pt^{2+}	---	< 1 - 9.5	0.5	---
*Digi***SEP PM-07**	Au^{3+}, Ag^{1+}, Pd^{2+}, Pt^{2+}, Pt^{4+}, Ru^{3+} (>Pm-02)	Minimum 6 M HCl	---	---	---
*Digi***SEP PM-08**	Ir^{3+}, Rh^{3+}, and Ru^{3+}	Minimum 6 M HCl	1 - 9.5	0.5	selectively elutable
*Digi***SEP PM-09**	Au^{3+}, Pt^{2+}, Pt^{4+}, Pd^{2+}	Minimum 6 M HCl	1 - 9.5	0.5	selectively elutable
*Digi***SEP PM-10**	Ir^{3+}, Ru, and/or Rh^{3+}	Minimum 6 M HCl	< 1.0	---	---

Ordering Information

Product Type	Columns (each) 4.6 x 50 mm	4.6 x 100 mm	Cartridge (5/pk)	Powder (10 g)
*Digi***SEP Pd-01**	010-750-031	010-751-031	010-720-031	010-790-031
*Digi***SEP Pd-02**	010-750-033	010-751-033	010-720-033	010-790-033
*Digi***SEP Pd-03**	010-750-035	010-751-035	010-720-035	010-790-035
*Digi***SEP PM-01**	010-750-037	010-751-037	010-720-037	010-790-037
*Digi***SEP PM-02**	010-750-039	010-751-039	010-720-039	010-790-039
*Digi***SEP PM-03**	010-750-041	010-751-041	010-720-041	010-790-041
*Digi***SEP PM-05**	010-750-045	010-751-045	010-720-045	010-790-045
*Digi***SEP PM-06**	010-750-047	010-751-047	010-720-047	010-790-047
*Digi***SEP PM-07**	010-750-049	010-751-049	010-720-049	010-790-049
*Digi***SEP PM-08**	010-750-051	010-751-051	010-720-051	010-790-051
*Digi***SEP PM-09**	010-750-053	010-751-053	010-720-053	010-790-053
*Digi***SEP 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
*Digi*SEP TE-01	Ag^{1+}, Au^{3+}, Cd^{2+}, Co^{2+}, Cu^{2+}, Fe^{2+}, Hg^{2+}, Ni^{2+},				acid elutable,
	Pb^{2+}, Pd^{2+}, Zn^{2+}	Water	4 - 9.5	0.5	> 1 ppm
*Digi*SEP TE-02	Ag^{1+}, Au^{3+}, Cd^{2+}, Co^{2+}, Cu^{2+}, Fe^{2+}, Hg^{2+}, Ni^{2+},				6 M HCl elutable,
	Pb^{2+}, Pd^{2+}, Zn^{2+}, Fe^{3+}, Mn^{2+}	Water	4 - 9.5	0.5	> 0.1 ppm
*Digi*SEP TE-03	Au^{3+}, Co^{2+}, Cu^{2+}, Hg^{2+}, Fe^{3+}, Pd^{2+}, Zn^{2+} (all pH				EDTA, 6 M elutable;
	range). Ag^{1+}, Cd^{2+}, Pb^{2+}, (pH>3), Cu^{2+} (pH<3)	Water	1 - 9.5	0.5	< 100 ppb
*Digi*SEP TE-04	Au^{3+}, Co^{2+}, Cu^{2+}, Hg^{2+}, Ni^{2+}, Pd^{2+}, Zn^{2+} (all pH				EDTA, 6 M elutable;
	range). Ag1+, Cd^{2+}, Pb^{2+}, (pH>3), Cu^{2+} (pH<3)	Water	1 - 9.5	0.5	< 100 ppb
*Digi*SEP TE-05	Fe^{3+}, Co^{3+}, Cu^{2+}, Hg^{2+}, Ni^{2+}, Pd^{2+}, Zn^{2+} (all pH				
	range), Mn^{2+}, Cd^{2+}, Zn^{2+} and Pb^{2+} (pH>3)	Water	1 - 9.5	0.5	Acid elutable
*Digi*SEP TE-06	Cu^{2+}	Water	2.0 - 9.5	0.5	Acid elutable
*Digi*SEP TE-07	Most +2, +3 and +4 metal ions as a group	Water	> 2.0	---	6 M HCl elutable
*Digi*SEP TE-09	Au^{3+}, Pb^{2+}, Hg^{2+}, Pd^{2+}, Ag^{2+}	Water	---	---	---
*Digi*SEP TE-10	Cu^{2+}, Ni^{2+}, Co^{2+}, Zn^{2+}	Water	0.5 - 3.0	---	6 M HCl elutable
*Digi*SEP TE-11	Ni^{2+}, Co^{2+}, Cu^{2+}, Zn^{2+}	Water	0.5 - 2.0	---	6 M HCl elutable
*Digi*SEP TE-12	Ni^{2+}, Co^{2+}, Cu^{2+}, Zn^{2+}	Water	0.5 - 2.0	---	6 M HCl elutable
*Digi*SEP TE-13	Ge^{2+}, Sn^{4+}, MoO_4^{2-}, borate as a group	Multiple	1 - 12	---	HCl elutable

Ordering Information

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

Table 6. Radioactive Nuceliotides

The potential of teeth as a biological indicator of $^{90}Sr^{2+}$ accumulation in the body has been pointed out since the early 1950's. The *Digi***SEP** Sr-01 cartridges can be used to isolate Sr^{2+} from the digested tooth sample.

Specifications

Product Type	Target Analyte	Matrix	Range (pH)	Optimal Flow Rate (ml/g/minute)	Remarks
*Digi***SEP Pu-01**	Pu^{3+}	> 2 M Acid	< 1 - 9.5	---	6 M HCl elutable
*Digi***SEP Pu-02**	Pu^{3+}	2 M acid	1.0 - 9.5	---	> 6 M HCl elutable
*Digi***SEP Sr-01**	Sr^{2+}	Waste Water	1 - 10.0	0.5	EDTA eluted
*Digi***SEP Cs-01**	Cs^{+}	Water	< 0 - 9.5	---	removal to 500 ppt
*Digi***SEP Tc-01**	TcO_4^-	---	1 - 14	0.1	---
*Digi***SEP Tc-02**	TcO_4^-	1 MH^+ or 0.1 M Na^+ or 0.01 MK^+	1 - 14	0.1	---
*Digi***SEP Ra-01**	Ra^{2+}	Water	< 0 - 9.5	< 0 - 9.5	EDTA elutable

Ordering Information

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

*Digi*SEP IC - Ion Chromatography Columns

Ordering Information

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

Cross Referencing

Product Type	Dionex®	Metrohm®	Agilent®
*Digi***SEP IC-1**	Ion Pac AS14A / IC-Pac A25S	IC 1H-424 / IC SI-90	---
*Digi***SEP IC-2**	---	---	G3154-65001
*Digi***SEP IC-3**	IonPac AS14S / IC-Pac A25S	IC 1H-424 / IC SI-90	---
*Digi***SEP IC-4**	---	IC NI-424	---
*Digi***SEP IC-G**	---	---	---

Solid Phase Extraction

DigiSEP Reagents

Reagents	Description	Concentration	Code	Catalog Number 500 ml	1 L	5 L
Ammonium Acetate	CH_3COONH_4	2 M		250-220-145	250-220-146	250-220-147
Nitric Acid	HNO_3	2 N	✓ ⑧	250-035-250	250-035-251	250-035-252
Water, Deionized, ASTM Type I	H_2O	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

Catalog No. 010-510-050

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	1	010-790-511
For making your own cartridges		
Polypropylene Frit	2	010-790-513
10 µm pore size		
12 Place Rack (12 position)	1	010-510-050

Catalog No. 010-790-503*

Catalog No. 010-790-501

Catalog No. 010-790-509

** Not exactly as shown*

⊗ *Glass Container* ⑥ *Poison* ③ *Flammable*
✓ *Dangerous Goods** ⑧ *Corrosive* 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

ICP-AES and ICP-MS Supplies

A complete line of ICP supplies available from **SCP SCIENCE** including:
- Nebulizers (ex. concentric, cross-flow, Teflon®, etc...)
- Quartzware (ex. torches, injectors, bonnets, etc...)
- ICP-MS Cones (ex. samplers, skimmers, o-rings, etc...)
- Calibration standards (ex. single, multi, custom blends)