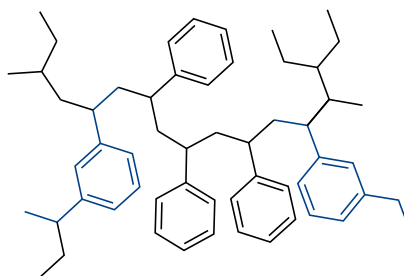


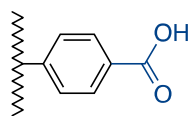
## Chemical structures of the phases

CHROMABOND® HR-X



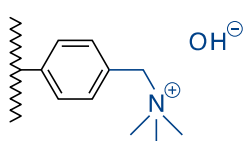
hydrophobic polystyrene-divinylbenzene copolymer  
spherical base material for efficient enrichment  
and ideal flow behavior

CHROMABOND® HR-XCW



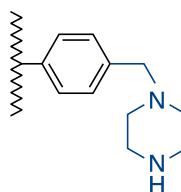
weak acidic  
cation exchanger

CHROMABOND® HR-XA



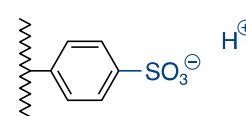
strong basic  
anion exchanger

CHROMABOND® HR-XAW



weak basic  
anion exchanger

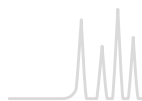
CHROMABOND® HR-XC



strong acidic  
cation exchanger

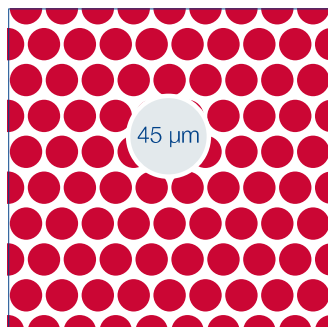
## Similar phases

CHROMABOND® HR-X:	Oasis® HLB, Strata™-X, Nexus, ENVI-Chrom P
CHROMABOND® HR-XC:	Oasis® MCX, Strata™-X-C, HyperSep™ Retain™-CX, StyreScreen® DBX
CHROMABOND® HR-XA:	Oasis® MAX, Strata™-X-A, HyperSep™ Retain™-AX, StyreScreen® QAX
CHROMABOND® HR-XCW:	Oasis® WCX, Strata™-X-CW
CHROMABOND® HR-XAW:	Oasis® WAX, Strata™-X-AW



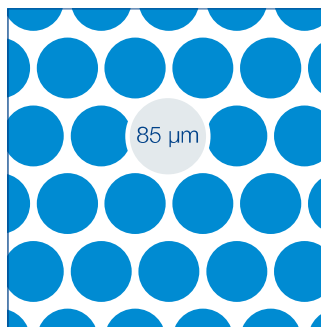
## 2 particle sizes - 1 goal: HR-Xpert for optimized sample preparation

For different application requirements the particle sizes complement each other perfectly.



Ideal for:

- Smaller sample volumes
- Smaller adsorbent weights
- Lower elution volumes



Recommended for:

- Large volume or viscous samples, heavy matrix load
- Operation without vacuum possible (e.g., for volatile analytes)
- Higher adsorbent weight without increase in back pressure

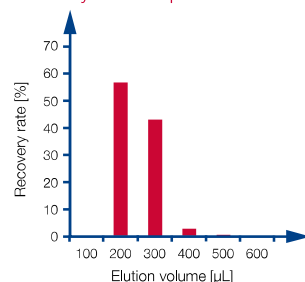
### Features of 45 µm particles

- About half the radius results in 8-fold particle number per volume for approx. equal adsorbent weight
- Same specific surface for both particle sizes: considerably larger freely accessible external surface for 45 µm particles
- Denser adsorbent packing: enhanced interaction of the analyte with the adsorbent, better extraction results

### Ideal elution characteristics

Method: 1 mL column with 30 mg CHROMABOND® HR-X, 1 mL standard solution (1 mg/mL hexobarbital), drying, elution in portions of 100 µL with methanol (see application 305490 at [www.mn-net.com/apps](http://www.mn-net.com/apps))

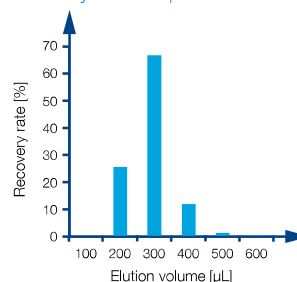
Recovery rates 45 µm



Advantages of 45 µm particles:

- Faster elution
- Lower elution volumes required

Recovery rates 85 µm



### Breakthrough behavior in enrichment

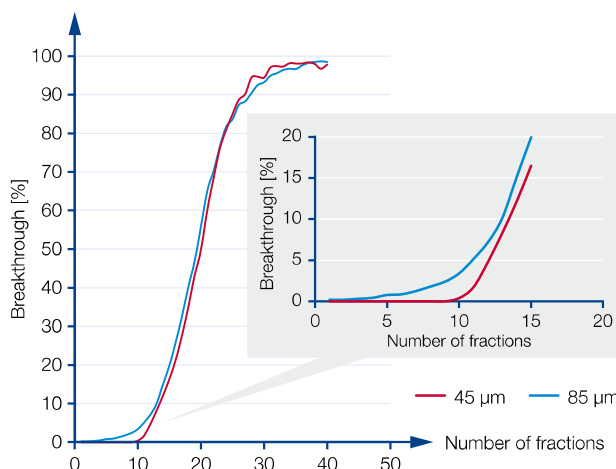
Method: 1 mL column with 15 mg CHROMABOND® HR-X, apply portions of 1 mL standard solution (250 µg/mL hexobarbital in water), collect eluates (see application 305480 at [www.mn-net.com](http://www.mn-net.com))

**45 µm (red)** The analyte is completely retained up to fraction 10.

**85 µm (blue)** Small amounts even break through with fraction 4.

45 µm particles provide better enrichment and breakthrough behavior for small adsorbent weights. When using larger adsorbent weights this effect is less pronounced, since then analytes have sufficient contact with the 85 µm adsorbent particles as well.

45 µm particles are ideal for small sample and elution volumes, while for large amounts of sample and adsorbent 85 µm particles show advantages due to better flow properties.

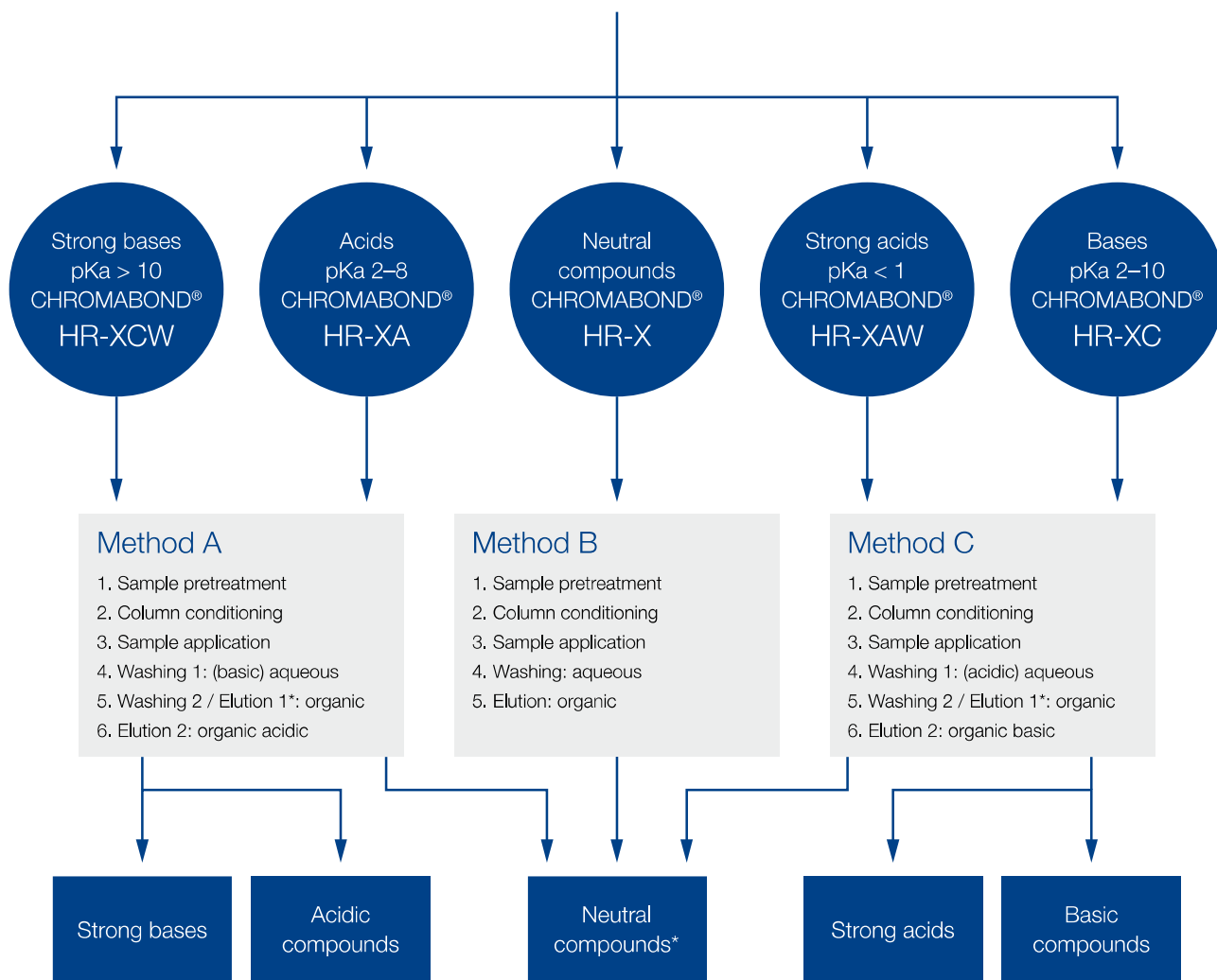




## The CHROMABOND® HR-*Xpert* concept for neutral, acidic and basic analytes

3 paths - 1 goal: cleaner samples

Depending on the character of the analytes HR-*Xpert* offers suitable adsorbents and optimal methods for sample preparation, cleaning and concentration.



\* Under organic washing and elution conditions the following compounds will be also eluted

HR-X: polar compounds such as organic acids and bases  
HR-XC, HR- XCW: acidic components and impurities  
HR-XA, HR- XAW: basic components and impurities



## CHROMABOND® HR-X HR-X spherical, hydrophobic polystyrene-divinylbenzene adsorbent resin

## ★ Key features

- High-purity material with highest reproducibility and lowest blank values due to an optimized manufacturing process
- Excellent recovery rates especially for the enrichment of pharmaceuticals and active ingredients due to the spherical structure of the particles, very homogeneous surface and optimized pore structure

## 🔧 Technical characteristics

- Hydrophobic polystyrene-divinylbenzene copolymer, pH stability 1–14
- Spherical particles, size 45 µm and 85 µm (standard), pore size 55–60 Å, very high surface 1000 m<sup>2</sup>/g, capacity 390 mg/g (caffeine in water)

## ✓ Recommended application

- Pharmaceuticals / active ingredients from tablets, creams and water / waste water
- Drugs and pharmaceuticals from urine, blood, serum and plasma
- Trace analysis of pesticides, herbicides, phenols, PAHs and PCBs from water

Drugs from water  
MN Appl. No. 304240

Column type:  
CHROMABOND® HR-X, 3 mL, 200 mg  
REF 730931

Sample: 1 µg/mL each in water

Column conditioning: 5 mL methanol, 5 mL dist. water

Sample application:

slowly aspirate 500 mL water (pH 3) through the column

Column washing: 5 mL water

Elution: after drying 3 x 2 mL acetonitrile

Further analysis: HPLC on NUCLEODUR® C<sub>18</sub> Gravity, 5 µm; see MN Appl. No. 121690

## Recovery rates [%]

Compound	HR-X	Strata™ X
Ketoprofen	98	92
Ibuprofen	91	93
Pentobarbital	99	95
Meclofenamic acid	92	93
Protriptyline	63	45
Nortriptyline	53	39

Pesticides from water  
MN Appl. No. 304250 / 304260

Column type:  
CHROMABOND® HR-X, 3 mL, 200 mg  
REF 730931

Sample pretreatment: samples are spiked with 500 ng of each pesticide in 1000 mL water, adjusted to pH 2 with HCl or pH 7

Column conditioning:

10 mL methanol, 10 mL dist. water

Sample application:

slowly pass 1000 mL spiked water sample through the column with the aid of a tubing adapter (REF 730243)

Elution: after drying 5 mL methanol – THF (1:1, v/v)

Further analysis: HPLC

## Recovery rates [%]

Compound	HR-X pH 2	Compound	HR-X pH 7
Metamitron	86	Desisopropylatrazine	90
Quinmerac	90	2,4-Dichlorobenzamide	95
Chloridazon	93	Desethylatrazine	89
Picloram	83	Hexazinone	95
Metribuzin	84	Bromacil	103
Cyanazine	83	Simazine	91
Metabenzthiazuron	94	Desethylterbutylazine	89
Chlortoluron	91	Atrazine	88
Isoproturon	89	Metalaxyl	97
Diuron	91	Metazachlor	93
Dimethenamid-P	89	Propazine	88
Linuron	94	Terbutylazine	86
Epoxyconazole	85	Metolachlor	97
Penconazole	90		
Alachlor	93		
Propiconazole-1	89		
Flufenacet	91		
Diflufenicam	58		
Triallate	42		

For further applications on CHROMABOND® phases visit our online application database at [www.mn-net.com/apps](http://www.mn-net.com/apps)



## Standard protocol for CHROMABOND® HR-X

MN Appl. No. 304310



Column type:  
CHROMABOND® HR-X, 3 mL, 200 mg  
REF 730931

Sample pretreatment: if necessary, adjust pH value

Column conditioning: 5 mL methanol

Equilibration: 5 mL water

Sample application: slowly aspirate the sample through the column

Column washing: 5 mL water – methanol (95:5, v/v)

Elution: after drying 3 x 2 mL methanol

Further analysis: if necessary, evaporate and redissolve in a suitable solvent; HPLC or GC

## Highest reproducibility Barbiturates from serum

MN Appl. No. 304290



Column type:  
CHROMABOND® HR-X, 3 mL, 200 mg  
REF 730931

Sample: 100 ng/mL each in serum

Column conditioning: 5 mL methanol, 5 mL dist. water

Sample application: 1 mL spiked serum

Column washing: 5 mL water

Elution: after drying 3 x 2 mL methanol

Further analysis: HPLC on NUCLEODUR® 100-5 C<sub>18</sub> ec, see MN Appl. No. 117820

- Within each batch
- From batch to batch

Compounds:

- A phenobarbital
- B pentobarbital
- C hexobarbital

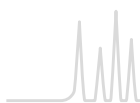


## Ordering information

	Volume	Adsorbent weight →						Pack of
		30 mg	60 mg	100 mg	200 mg	500 mg	1 g	
	CHROMABOND® HR-X polypropylene columns (85 µm)							
	1 mL	730934		730935				30
	3 mL		730936		730931	730937		30
	6 mL				730938	730939		30
	15 mL					730940	730941	20
	CHROMABOND® HR-X polypropylene columns (85 µm) · BIGpacks							
	3 mL				730931,250			250
	6 mL				730938,250	730939,250		250
	CHROMABOND® HR-X polypropylene columns (45 µm)							
	1 mL	730934P45		730935P45				30
	3 mL		730936P45		730931P45			30
	CHROMABOND® LV-HR-X (85 µm)							
	15 mL	732130	732131		732132			30
		96 x 10 mg (45 µm)	96 x 25 mg (45 µm)	96 x 50 mg (85 µm)	96 x 100 mg (85 µm)			Pack of
	CHROMABOND® MULTI 96 HR-X							
		738530,010M	738530,025M	738530,050M	738530,100M			1

Glass columns, LV columns and MULTI 96 on request.

For further applications on CHROMABOND® phases visit our online application database at [www.mn-net.com/apps](http://www.mn-net.com/apps)



## CHROMABOND® HR-XC strong cation exchanger

## ★ Key features

- High purity material, highest reproducibility and lowest blank values due to an optimized production process
- Outstanding recovery rates especially for the enrichment of basic analytes

## 🔧 Technical characteristics

- Strong acidic benzenesulfonic acid cation exchanger, exchange capacity 1.0 meq/g, base material polystyrene-divinylbenzene copolymer, pH stability 1–14
- Spherical particles, size 45 µm and 85 µm (standard), pore size 65–75 Å, very large specific surface 800 m<sup>2</sup>/g, pore volume 1.4 cm<sup>3</sup>/g, RP capacity 300 mg/g (caffeine in water)

## ✓ Recommended application

- Basic active ingredients from heavily matrix-contaminated samples like, e.g., urine, plasma, serum
- Fungicides from food
- Basic analytes like, e.g., amines
- Bases with pKa 2–10

## Standard protocol for CHROMABOND® HR-XC

MN Appl. No. 304790

Column type:  
CHROMABOND® HR-XC, 3 mL, 200 mg  
REF 730952

Sample pretreatment: adjust pH value if necessary

Column conditioning: 5 mL methanol

Equilibration: 5 mL water

Sample application: slowly aspirate sample through the column

Column washing 1: 2 mL 0.1 mol/L HCl in Wasser

Column washing 2 / Elution 1: 2 mL methanol (neutral and acidic compounds); if necessary, further washing steps

Elution 2: after drying 5 mL methanol – 5 % NH<sub>3</sub> (basic compounds)

Further analysis: if necessary, evaporate and redissolve in a suitable solvent; HPLC or GC

## Fractionation of acidic, neutral and basic analytes from serum

MN Appl. No. 304780

Column type:  
CHROMABOND® HR-XC, 3 mL, 200 mg  
REF 730952

Sample: 1 mL spiked matrix, acidified with 200 µL 2 % H<sub>3</sub>PO<sub>4</sub>

Column conditioning: 5 mL methanol, then 5 mL water

Sample application: slowly aspirate sample through the column

Column washing: 2 mL 0.1 mol/L HCl

Elution: 2.5 mL methanol (fraction A: neutral and acidic analytes); then 5 mL methanol – NH<sub>3</sub> 90:10, v/v (fraction B: basic analytes)

Further analysis:

for fraction A:

HPLC, e.g., on NUCLEODUR® C<sub>18</sub> Gravity, see MN Appl. No. 122230;



for fraction B:

HPLC on NUCLEODUR® C<sub>8</sub> Gravity, see MN Appl. No. 118520

## Recovery rates [%]

Fraction A: neutral and acidic analytes		Fraction B: basic analytes			
Compound	HR-XC	Compound	HR-XC	Oasis® MCX	Strata™ X-C
Suprofen	108	Doxepin	101	68	82
Naproxen	85	Imipramine	95	71	85
Tolmetin	73	Amitriptyline	94	72	78
Phenobarbital	108	Trimipramine	92	70	81
Indomethacin	33				
Hexobarbital	80				

## Ordering information

	Volume	Adsorbent weight →						Pack of	
		30 mg	60 mg	100 mg	150 mg	200 mg	500 mg		
	CHROMABOND® HR-XC polypropylene columns (85 µm)								
	1 mL	730969		730049					30
	3 mL		730956			730952	730953		30
	6 mL				730957		730955	30	
	CHROMABOND® HR-XC polypropylene columns (45 µm)								
	1 mL	730969P45		730049P45				30	
	3 mL		730956P45			730952P45		30	
	Size →	S		M		L			
	Minimum adsorbent weight →	50 mg		140 mg		400 mg		Pack of	
	CHROMAFIX® HR-XC cartridges (85 µm)								
		731755		731756		731757		50	

Glass columns, I.V. columns and MULTI 96 on request.

Glass columns, LV columns and MULTI 96 on request.



## CHROMABOND® HR-XA strong anion exchanger

### ★ Key features

- High purity material with highest reproducibility and lowest blank values due to an optimized production process
- Outstanding recovery rates especially for the enrichment of acidic analytes

### 🔧 Technical characteristics

- Strong basic quaternary ammonium anion exchanger, exchange capacity 0.25 meq/g, pKa ~ 18, base material polystyrene-divinylbenzene copolymer, pH stability 1–14
- Spherical particles, size 45 µm and 85 µm (standard), pore size 55–65 Å, very large specific surface 850 m<sup>2</sup>/g, pore volume 1.4 cm<sup>3</sup>/g, RP capacity 350 mg/g (caffeine in water)

### ✓ Recommended application

- Acidic active ingredients from heavily matrix-contaminated samples like, e.g., urine, plasma, serum
- Phenolic acids
- Acidic herbicides
- Weak / medium-strength acids with pKa 2–8

### Standard protocol for CHROMABOND® HR-XA

MN Appl. No. 304970

 **Column type:**  
CHROMABOND® HR-XA, 3 mL, 200 mg  
REF 730951

**Sample pretreatment:**  
individual sample preparation with reference to analytes and matrix

**Column conditioning:** 5 mL methanol

**Equilibration:** 5 mL water

**Sample application:** slowly aspirate sample through the column




**Column washing 1:** 2 mL 0.1 mol/L NaOH in water

**Column washing 2 / Elution 1:** 2 mL methanol (neutral and basic compounds), if necessary, further washing steps

**Elution 2:** after drying 5 mL methanol – 1 to 10 % formic acid (acidic compounds)

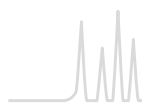
**Further analysis:** if necessary, evaporate and redissolve in a suitable solvent; HPLC or GC MN Appl. No. 304970

### Ordering information

	Volume	Adsorbent weight →					Pack of
		30 mg	60 mg	100 mg	150 mg	200 mg	500 mg
	<b>CHROMABOND® HR-XA polypropylene columns (85 µm)</b>						
	1 mL	730968		730727			30
	3 mL		730950			730951	30
	6 mL				730958		30
	<b>CHROMABOND® HR-XA polypropylene columns (45 µm)</b>						
	1 mL	730968P45		730727P45			30
	3 mL		730950P45			730951P45	30
	<b>Size →</b>	S		M		L	
	<b>Minimum adsorbent weight →</b>	70 mg		180 mg		510 mg	Pack of
	<b>CHROMAFIX® HR-XA cartridges (85 µm)</b>						
		731768		731769		731770	50

Glass columns, LV columns and MULTI 96 on request.

For further applications on CHROMABOND® phases visit our online application database at [www.mn-net.com/apps](http://www.mn-net.com/apps)



## CHROMABOND® HR-XCW weak cation exchanger

## ★ Key features

- High purity material, highest reproducibility and lowest blank values due to an optimized production process
- Outstanding recovery rates especially for enrichment of strongly basic analytes

## 🔧 Technical characteristics

- Weak acidic carboxylic acid cation exchanger, exchange capacity >0.7 meq/g, pKa ~ 5, base material spherical PS/DVB copolymer, pH stability 1–14
- Spherical particles, size 45 µm and 85 µm (standard), pore size 50–60 Å very large specific surface 850 m<sup>2</sup>/g, pore volume 1.2–1.4 cm<sup>3</sup>/g, RP capacity 350 mg/g (caffeine in water)

## ✓ Recommended application

- Basic compounds like quaternary amines
- Active ingredients from heavily matrix-contaminated samples like, e.g., urine, plasma, serum
- Strong bases with pKa > 10

## Standard protocol for CHROMABOND® HR-XCW

MN Appl. No. 305300

Column type:  
CHROMABOND® HR-XCW, 3 mL, 200 mg  
REF 730739

## Sample pretreatment:

individual sample preparation with reference to analytes and matrix

Column conditioning: 5 mL methanol, 5 mL water

## Sample application:

slowly aspirate sample through the column




Column washing 1: 2 mL acidified water

Column washing 2 / Elution 1: 2 mL methanol (neutral and acidic compounds), further washing steps if necessary

Elution 2: after drying 2 x 2 mL methanol – 1 to 5 % formic acid (strongly basic compounds)

Further analysis: if necessary, evaporate and redissolve in a suitable solvent; HPLC or GC

## Ordering information

	Volume	Adsorbent weight →						Pack of
		30 mg	60 mg	100 mg	150 mg	200 mg	500 mg	
	CHROMABOND® HR-XCW polypropylene columns (85 µm)							
	1 mL	730731		730733			30	
	3 mL		730735			730739	730741	
	6 mL				730737		730743	30
	CHROMABOND® HR-XCW polypropylene columns (45 µm)							
	1 mL	730731P45		730733P45			30	
	3 mL		730735P45			730739P45	30	
	Size →	S		M		L		
	Minimum adsorbent weight →	60 mg		160 mg		450 mg	Pack of	
	CHROMAFIX® HR-XCW cartridges (85 µm)							
		731774		731775		731776	50	
	Glass columns, LV columns and MULTI 96 on request.							

Glass columns, LV columns and MULTI 96 on request.





## CHROMABOND® HR-XAW weak anion exchanger

### ★ Key features

- High purity material with highest reproducibility and lowest blank values due to an optimized production process
- Outstanding recovery rates especially for enrichment of acidic analytes

### 🔧 Technical characteristics

- Weak basic secondary and tertiary ammonium anion exchanger, exchange capacity >0.5 meq/g, pKa ~ 6, base material spherical PS/DVB copolymer, pH stability 1–14
- Spherical particles, size 45 µm and 85 µm (standard), pore size 55–65 Å very large specific surface 850 m<sup>2</sup>/g, pore volume 1.2–1.4 cm<sup>3</sup>/g, RP capacity 350 mg/g (caffeine in water)

### ✓ Recommended application

- Perfluorinated surfactants
- Acidic compounds like sulfonates
- Active ingredients from heavily matrix-contaminated samples like, e.g., urine, plasma, serum
- Strong acids with pKa < 1

### Standard protocol for CHROMABOND® HR-XAW

MN Appl. No. 305200

 **Column type:**  
CHROMABOND® HR-XAW, 3 mL, 200 mg  
REF 730748

#### Sample pretreatment:

individual sample preparation with reference to analytes and matrix

**Column conditioning:** 5 mL methanol

**Equilibration:** 5 mL water

#### Sample application:

slowly aspirate sample through the column

**Column washing 1:** 25 mmol/L ammonium acetate

**Column washing 2 / Elution 1:** 2 mL methanol (neutral and basic compounds), if necessary, further washing steps


**Elution 2:** after drying 2 x 2 mL methanol – 1 to 5 % ammonia (strongly acidic compounds)

Further analysis: if necessary, evaporate and redissolve in a suitable solvent; HPLC or GC

### Analysis of perfluorinated surfactants from water

MN Appl. No. 305140

Application in accordance with DIN 38407-42

 **Column type:**  
CHROMABOND® HR-XAW, 3 mL, 60 mg  
REF 730747

**Sample:** 500 mL water, spiked with 1 mL standard solution (20 µg/L of each compound)

#### Column conditioning:

2 mL methanol + 5 % ammonia, then 2 mL methanol, finally 2 mL water

#### Sample application:

slowly aspirate sample through the column

**Column washing:** 2 mL water, then 2 mL acetone – acetonitrile – formic acid (50:50:1, v/v/v), finally 2 mL methanol




**Elution:** 2 mL methanol with 5 % ammonia

Further analysis: evaporate to dryness in a stream of nitrogen under slight heating, and redissolve in a suitable solvent for HPLC

### Recovery rates [%]

Compound	Recovery
Perfluoropropionic acid (PFPrA)	103
Perfluoropentanoic acid (PFPeA)	94
Perfluorohexanoic acid (PFHxA)	94
Perfluorooctanoic acid (PFOA)	95
Perfluorooctane sulfonate K salt (PFOS)	81
Perfluorododecanoic acid (PFDoDA)	82

## Ordering information

	Volume	Adsorbent weight →						Pack of
		30 mg	60 mg	100 mg	150 mg	200 mg	500 mg	
	CHROMABOND® HR-XAW polypropylene columns (85 µm)							
	1 mL	730728		730729				30
	3 mL		730747			730748	730744	30
	6 mL				730749		730745	30
	CHROMABOND® HR-XAW polypropylene columns (45 µm)							
	1 mL	730728P45		730729P45				30
	3 mL		730747P45			730748P45		30
	Size →	S		M		L		
	Minimum adsorbent weight →	50 mg		120 mg		360 mg		Pack of
	CHROMAFIX® HR-XAW cartridges (85 µm)							
		731771		731772		731773		50

Glass columns, LV columns and MULTI 96 on request.