

CLEAN-UP®

Solid Phase Extraction Columns

Silica Based Copolymer Columns



Copolymeric Phases Offered:

- Hydrophobic plus Cyclohexyl
- Hydrophobic plus Cyanopropyl
- Hydrophobic plus Propylsulfonic Acid
- Hydrophobic plus Carboxylic Acid
- Hydrophobic plus Benzenesulfonic Acid
- Hydrophobic plus Quaternary Amine
- Hydrophobic plus Aminopropyl

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Applications Manual

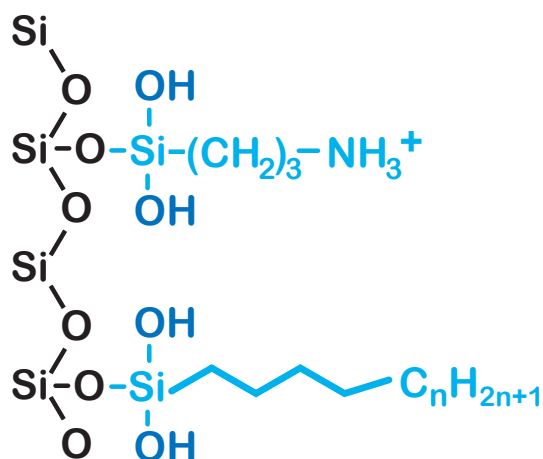
CLEAN-UP[®]

Copolymeric Extraction Columns

(Ion Exchange with Hydrophobic Character)

This sorbent is composed of a silica backbone with two types of functional chains attached - an ion exchanger or polar chain and a hydrophobic carbon chain. Our copolymeric phases are produced in a way to allow for equal parts of each functional group to attach to the silica backbone. This copolymerization technique yields reproducible bonded-phases and unique copolymeric chemistries which allow the controlled use of mixed mode separation mechanisms. The advantage of this type of dual chemistry is beneficial especially when one is looking for both a neutral & charged compound. This is common when a neutral parent drug metabolizes & becomes a charged compound.

example of a copolymeric phase



- Silica Backbone
- Hydrophobic Chain
- Ion Exchanger

Analytes*	Washes	Elutions
Cations/Anions Alkanes Alkenes Aromatics	1) aqueous to disrupt hydrophilic interactions. 2) methanol to disrupt residual hydrophobic and hydrophilic interferences.	1) organic, possibly with some aqueous to elute hydrophobically bound analytes. 2) aqueous buffer with a pH that would neutralize ionically bound analytes or an aqueous with high ionic strength or a solvent with a counter ion that would bind to sorbent.

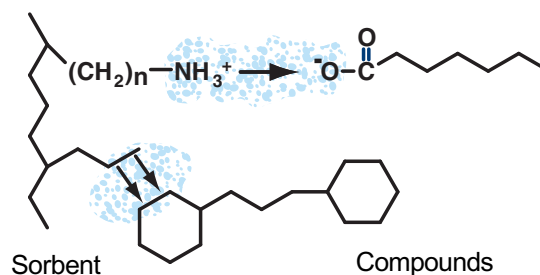
*Typical compounds which can be extracted using copolymeric columns.

Copolymeric Sorbents & Structures

Sorbent	Structure*	pKa
Benzenesulfonic Acid (BCX2) strong cation exchange column	$-\text{Si}-(\text{CH}_2)_2-\text{C}_6\text{H}_4-\text{SO}_3\text{H}$	always charged
Propylsulfonic Acid (PCX2) strong cation exchange column	$-\text{Si}-(\text{CH}_2)_3-\text{SO}_3\text{H}$	< 1
Carboxylic Acid (CCX2) weak cation exchange column	$-\text{Si}-(\text{CH}_2)_2-\text{COOH}$	4.8
Quaternary amine (QAX2) strong anion exchange column	$-\text{Si}-(\text{CH}_2)_3-\text{N}^+(\text{CH}_3)_3$	always charged
Aminopropyl (NAX2) weak anion exchange column	$-\text{Si}-(\text{CH}_2)_3-\text{NH}_3^+$	9.8
Cyanopropyl (CNP2) hydrophilic exchange column	$-\text{Si}-(\text{CH}_2)_3-\text{CN}$	
Cyclohexyl (CYH2) hydrophobic exchange column	$-\text{Si}-(\text{CH}_2)-\text{C}_6\text{H}_{11}$	

*Each copolymeric sorbent also contains a carbon chain approximately equal to a C8 chain

Example of Copolymeric Bonding

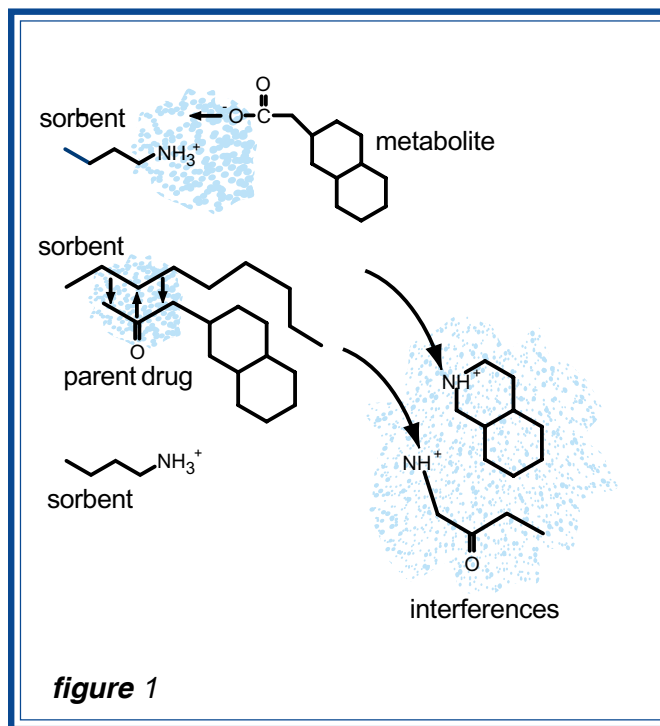


Mechanism of Copolymeric Bonding

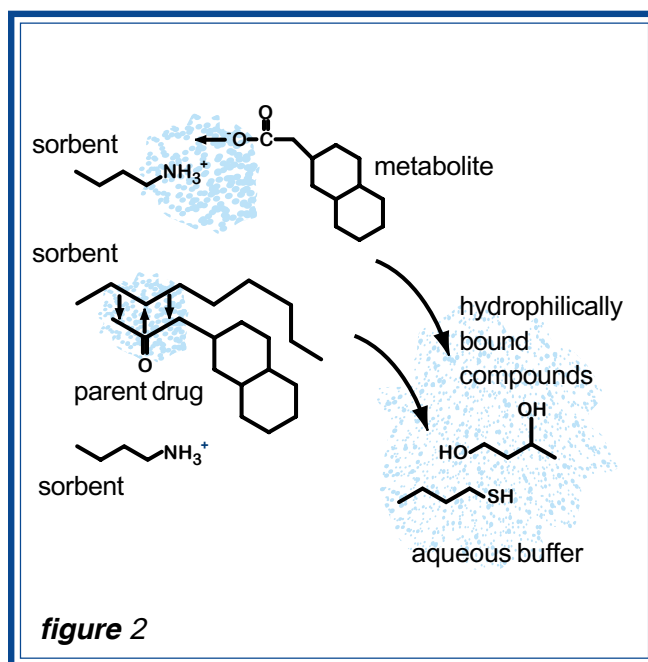
Using a sample composed of a theoretical neutral parent drug and its charged (acidic) metabolite, it is applied at a pH of 6 (figure 1). At this pH, many amine groups are positively charged. Since the column is also positively charged, compounds with this chemistry (cations) are repelled. Depending on the pKa of the metabolite, carboxylic acid groups may be negatively charged, allowing the metabolite to bond to the positively charged sorbent. Since the column also possesses a hydrophobic chain, the neutral parent drug also bonds to the column.

Water or a weak aqueous buffer (pH6) washes away hydrophilically bound interferences (figure 2). The column is then dried, careful to free the column of any residual aqueous phase that would interfere with elution.

Sample Application



Column Wash



Elution 1

The hydrophobically bound neutral parent drug is eluted with a solvent of minimal polarity, such as hexane/ethyl acetate - 80:20 .

figure 3

Elution 2

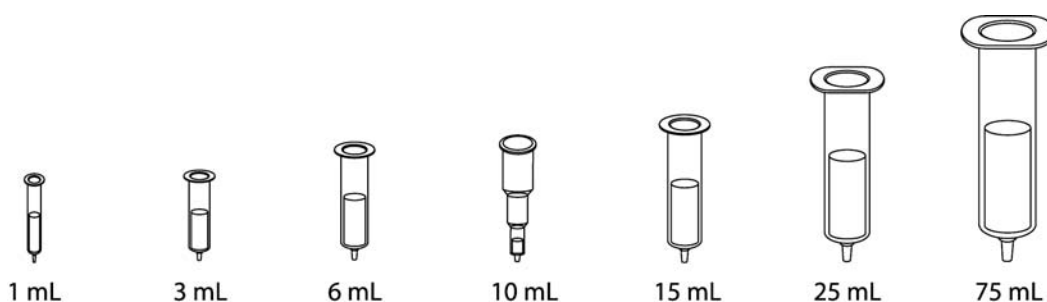
The final elution employs an acid to neutralize the charge of acidic analytes. Ionic interaction is released, and analytes are eluted in an appropriate solvent mixture.

figure 4

Anion Exchange Sorbent			Cation Exchange Sorbent			
	Goal	pH	Goal	pH		
WASH	To promote bonding between sorbent and analyte	> analyte pKa or < sorbent pKa	To promote bonding between sorbent and	< analyte pKa or > sorbent pKa		
Elution	To disrupt bonding between sorbent and analyte	< analyte pKa or > sorbent pKa	To disrupt bonding between sorbent and	> analyte pKa or < sorbent pKa		
Percent of Compound in Ionic State						
Functionality	Ionization	pH units away from pKa				
		2 < pKa	1 < pKa	at pKa	1 > pKa	2 > pKa
Acid	Anionic (-)	1	9	50	91	99
Base	Cationic (+)	99	91	50	9	1

CLEAN-UP[®] Solid Phase Extraction Columns

Copolymeric Product Guide



Chemistries are offered on these particle sizes.

Small Particle (5-20 μm)

Intermediate Particle (25-40 μm)

Standard Particle (40-60 μm)

Large Particle (125-210 μm)

Hydrophobic plus Cyclohexyl

Part Number Unencapped	Amount sorbent / Tube volume	Units per bag
CUCYH211	100mg / 1mL	100
CUCYH223	200mg / 1mL	50
CUCYH253	500mg / 3mL	50
CUCYH256	500mg / 6mL	50
CUCYH21Z	100mg / 10mL	50
CUCYH22Z	200mg / 10mL	50
CUCYH25Z	500mg / 10mL	50
CUCYH2M6	1g / 6mL	30
CUCYH22M6	2g / 6mL	20
CUCYH22M15	2g / 15mL	20
CUCYH25M25	5g / 25mL	20
CUCYH210M75	10g / 75mL	10

% Organic Loading: N/A

Exchange Capacity - (meq/g): N/A

Application:

Dual functionality for phenols and hydrophobic compounds

Hydrophobic plus Cyanopropyl

Part Number Unencapped	Amount sorbent / Tube volume	Units per bag
CUCNP211	100mg / 1mL	100
CUCNP223	200mg / 1mL	50
CUCNP253	500mg / 3mL	50
CUCNP256	500mg / 6mL	50
CUCNP21Z	100mg / 10mL	50
CUCNP22Z	200mg / 10mL	50
CUCNP25Z	500mg / 10mL	50
CUCNP2M6	1g / 6mL	30
CUCNP22M6	2g / 6mL	20
CUCNP22M15	2g / 15mL	20
CUCNP25M25	5g / 25mL	20
CUCNP210M75	10g / 75mL	10

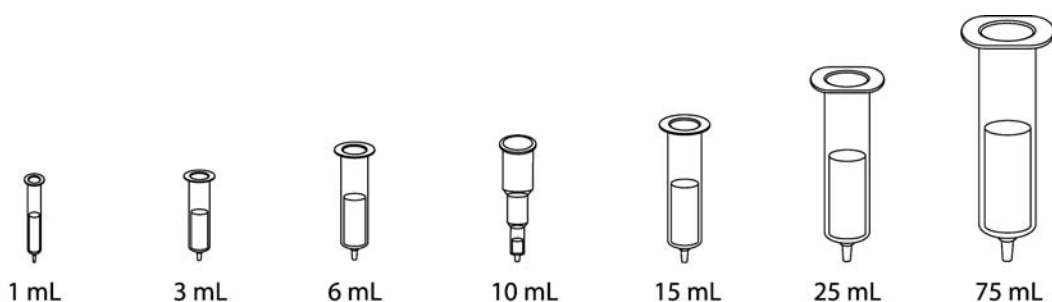
% Organic Loading: 14.60

Exchange Capacity - (meq/g): 0.163

Application:

Dual functionality for polar and hydrophobic compounds

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Chemistries are offered on these particle sizes.

Small Particle (5-20 μm)

Intermediate Particle (25-40 μm)

Standard Particle (40-60 μm)

Large Particle (125-210 μm)

Hydrophobic plus Propylsulfonic Acid

Part Number Unencapped	Amount sorbent / Tube volume	Units per bag
CUPCX2L1	50mg / 1mL	100
CUPCX211	100mg / 1mL	100
CUPCX223	200mg / 3mL	50
CUPCX253	500mg / 3mL	50
CUPCX256	500mg / 6mL	50
CUPCX21Z	100mg / 10mL	50
CUPCX22Z	200mg / 10mL	50
CUPCX25Z	500g / 10mL	50
CUPCX2M6	1g / 6mL	30
CUPCX22M15	2g / 15mL	20
CUPCX25M25	5g / 25mL	20
CUPCX210M75	10g / 75mL	10

% Organic Loading: 14.62

Exchange Capacity - (meq/g): 0.114

Application:

Dual functionality for weak bases and hydrophobic compounds

Hydrophobic plus Carboxylic Acid

Part Number Unencapped	Amount sorbent / Tube volume	Units per bag
CUCCX2L1	50mg / 1mL	100
CUCCX211	100mg / 1mL	100
CUCCX223	200mg / 3mL	50
CUCCX253	500mg / 3mL	50
CUCCX256	500mg / 6mL	50
CUCCX21Z	100mg / 10mL	50
CUCCX22Z	200mg / 10mL	50
CUCCX25Z	500g / 10mL	50
CUCCX2M6	1g / 6mL	30
CUCCX22M15	2g / 15mL	20
CUCCX25M25	5g / 25mL	20
CUCCX210M75	10g / 75mL	10

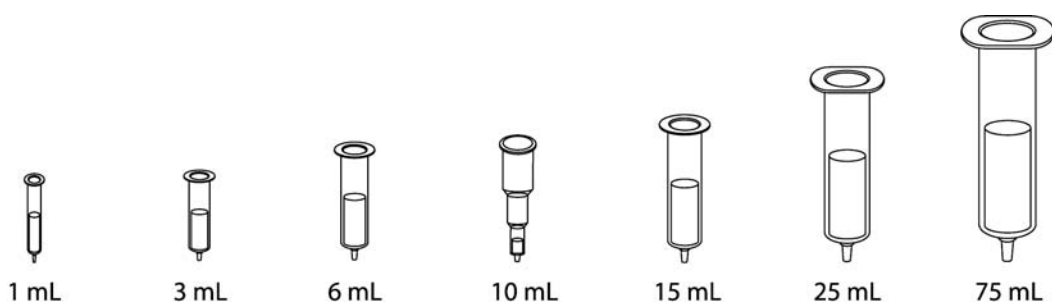
% Organic Loading: 12.50

Exchange Capacity - (meq/g): 0.105

Application:

Dual functionality for strong base and hydrophobic compounds

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Chemistries are offered on these particle sizes.

Small Particle (5-20 μm)

Intermediate Particle (25-40 μm)

Standard Particle (40-60 μm)

Large Particle (125-210 μm)

Hydrophobic plus Benzenesulfonic Acid

Part Number Unendcapped	Amount sorbent / Tube volume	Units per bag
CUBCX2L1	50mg / 1mL	100
CUBCX211	100mg / 1mL	100
CUBCX223	200mg / 3mL	50
CUBCX253	500mg / 3mL	50
CUBCX256	500mg / 6mL	50
CUBCX21Z	100mg / 10mL	50
CUBCX22Z	200mg / 10mL	50
CUBCX25Z	500g / 10mL	50
CUBCX2M6	1g / 6mL	30
CUBCX22M15	2g / 15mL	20
CUBCX25M25	5g / 25mL	20
CUBCX210M75	10g / 75mL	10

% Organic Loading: 12.30

Exchange Capacity - (meq/g): 0.072

Application:

Dual functionality for weak bases and hydrophobic compounds

Hydrophobic plus Quaternary Amine

Part Number Unendcapped	Amount sorbent / Tube volume	Units per bag
CUQAX2L1	50mg / 1mL	100
CUQAX211	100mg / 1mL	100
CUQAX223	200mg / 3mL	50
CUQAX253	500mg / 3mL	50
CUQAX256	500mg / 6mL	50
CUQAX21Z	100mg / 10mL	50
CUQAX22Z	200mg / 10mL	50
CUQAX25Z	500g / 10mL	50
CUQAX2M6	1g / 6mL	30
CUQAX22M15	2g / 15mL	20
CUQAX25M25	5g / 25mL	20
CUQAX210M75	10g / 75mL	10

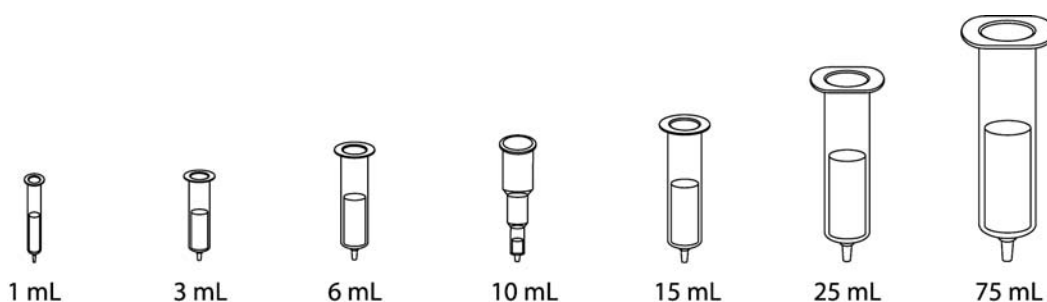
% Organic Loading: 13.60

Exchange Capacity - (meq/g): 0.160

Application:

Dual functionality for weak acids and hydrophobic compounds

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Chemistries are offered on these particle sizes.

Small Particle (5-20 μm)

Intermediate Particle (25-40 μm)

Standard Particle (40-60 μm)

Large Particle (125-210 μm)

Hydrophobic plus Aminopropyl

Part Number Unendcapped	Amount sorbent / Tube volume	Units per bag
CUNAX2L1	50mg / 1mL	100
CUNAX211	100mg / 1mL	100
CUNAX223	200mg / 3mL	50
CUNAX253	500mg / 3mL	50
CUNAX256	500mg / 6mL	50
CUNAX21Z	100mg / 10mL	50
CUNAX22Z	200mg / 10mL	50
CUNAX25Z	500g / 10mL	50
CUNAX2M6	1g / 6mL	30
CUNAX22M15	2g / 15mL	20
CUNAX25M25	5g / 25mL	20
CUNAX210M75	10g / 75mL	10

% Organic Loading: 12.3

Exchange Capacity - (meq/g): 0.163

Application:

Dual functionality for strong acids and hydrophobic compounds