

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. 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	Analytes:
	Cations/anions, alkanes, alkenes, aromatics.
<p> Silica Backbone Hydrophobic Chain Ion Exchanger </p>	<p>Washes:</p> <ol style="list-style-type: none"> 1) Aqueous to disrupt hydrophilic interactions. 2) Methanol to disrupt residual hydrophobic and hydrophilic interferences. <p>Elutions:</p> <ol style="list-style-type: none"> 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.

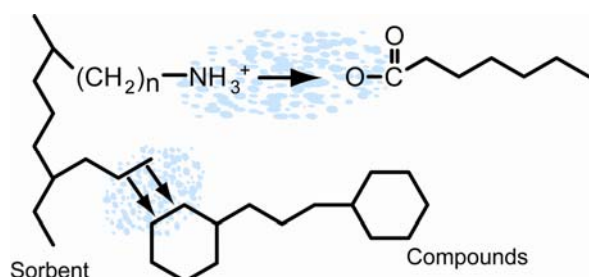
Copolymeric Sorbents & Structures

<u>Sorbent</u>	<u>Structure</u>	<u>pKa</u>
Benzenesulfonic Acid (BCX2) Strong Cation Exchange Column	-Si-(CH ₂) ₂ - SO ₃ H	always charged
Propylsulfonic Acid (PCX2) Strong Cation Exchange Column	-Si-(CH ₂) ₃ SO ₃ H	<1
Carboxylic Acid (CCX2) Weak Cation Exchange Column	-Si-(CH ₂) ₂ COOH	4.8
Quaternary amine (QAX2) Strong Anion Exchange Column	-Si-(CH ₂) ₃ N ⁺ (CH ₃) ₃	always charged
Aminopropyl (NAX2) Weak Anion Exchange Column	-Si-(CH ₂) ₃ NH ₃ ⁺	9.8
Cyanopropyl (CNP2) Hydrophilic Exchange Column	-Si-(CH ₂) ₃ CN	
Cyclohexyl (CYH2) Hydrophobic Exchange Column	-Si-(CH ₂)	

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

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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.

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	< 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	> analyte pKa or < sorbent pKa		
Percent of Compound in Ionic State						
Functionality	Ionization State	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

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Sample Application

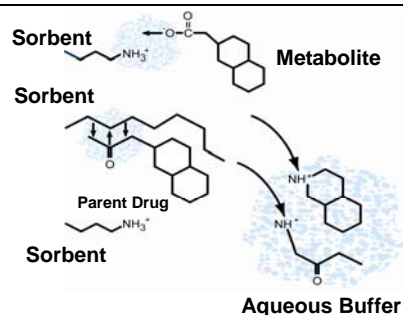


figure 1

Column Wash

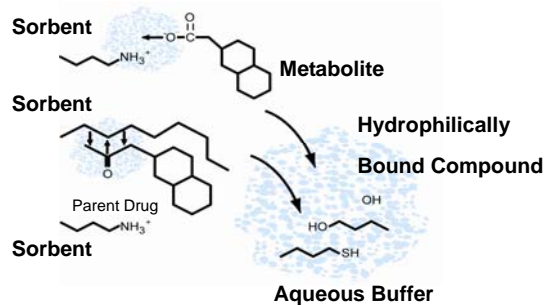


figure 2

Elution 1

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

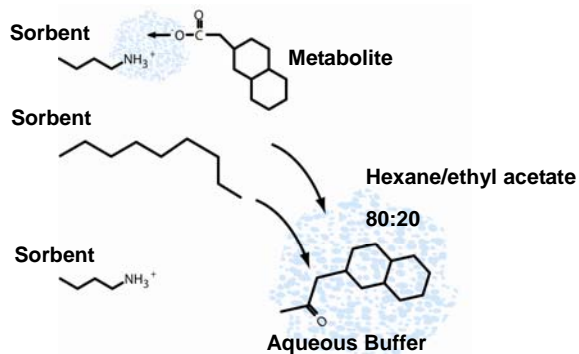


figure 3

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.

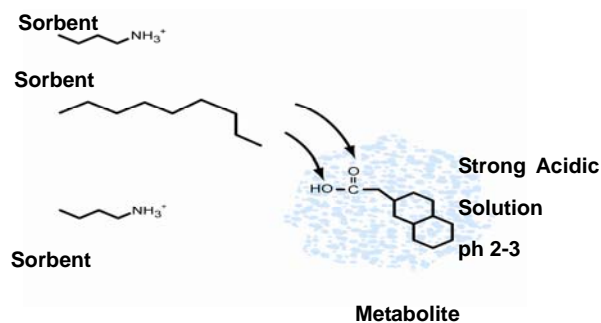


figure 4

CLEAN-UP[®] Copolymeric Extraction Columns

Part Number	Sorbent Amount/ Tube Volume	Unit per Pack	Description
Hydrophobic plus Cyclohexyl			
CUCYH2L1	50mg/1mL	100	<p>% Organic Loading: N/A</p> <p>Exchange Capacity (meq/g): N/A</p> <p>Application: Dual functionality for phenols and hydrophobic compounds.</p>
CUCYH211	100mg/1mL	100	
CUCYH223	200mg/3mL	50	
CUCYH253	500mg/3mL	50	
CUCYH256	500mg/6mL	50	
CUCYH2M6	1g/6mL	30	
CUCYH21Z	100mg/10mL	50	
CUCYH22Z	200mg/10mL	50	
CUCYH25Z	500mg/10mL	50	
CUCYH22M15	2g/15mL	20	
CUCYH25M25	5g/25mL	20	
CUCYH210M75	10g/75mL	10	
Hydrophobic plus Cyanopropyl			
CUCNP2L1	50mg/1mL	100	<p>% Organic Loading: 14.60</p> <p>Exchange Capacity (meq/g): 0.163</p> <p>Application: Dual functionality for polar and hydrophobic compounds.</p>
CUCNP211	100mg/1mL	100	
CUCNP223	200mg/3mL	50	
CUCNP253	500mg/3mL	50	
CUCNP256	500mg/6mL	50	
CUCNP2M6	1g/6mL	30	
CUCNP21Z	100mg/10mL	50	
CUCNP22Z	200mg/10mL	50	
CUCNP25Z	500mg/10mL	50	
CUCNP22M15	2g/15mL	20	
CUCNP25M25	5g/25mL	20	
CUCNP210M75	10g/75mL	10	
Hydrophobic plus Propylsulfonic Acid			
CUPCX2L1	50mg/1mL	100	<p>% Organic Loading: 14.62</p> <p>Exchange Capacity (meq/g): 0.114</p> <p>Application: Dual functionality for weak bases and hydrophobic compounds.</p>
CUPCX211	100mg/1mL	100	
CUPCX223	200mg/3mL	50	
CUPCX253	500mg/3mL	50	
CUPCX256	500mg/6mL	50	
CUPCX2M6	1g/6mL	30	
CUPCX21Z	100mg/10mL	50	
CUPCX22Z	200mg/10mL	50	
CUPCX25Z	500mg/10mL	50	
CUPCX22M15	2g/15mL	20	
CUPCX25M25	5g/25mL	20	
CUPCX210M75	10g/75mL	10	

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Part Number	Sorbent Amount/ Tube Volume	Unit per Pack	Description
Hydrophobic plus Carboxylic Acid			
CUCCX2L1	50mg/1mL	100	<p>% Organic Loading: 12.50</p> <p>Exchange Capacity (meq/g): 0.105</p> <p>Application: Dual functionality for strong base and hydrophobic compounds.</p>
CUCCX211	100mg/1mL	100	
CUCCX223	200mg/3mL	50	
CUCCX253	500mg/3mL	50	
CUCCX256	500mg/6mL	50	
CUCCX2M6	1g/6mL	30	
CUCCX21Z	100mg/10mL	50	
CUCCX22Z	200mg/10mL	50	
CUCCX25Z	500mg/10mL	50	
CUCCX22M15	2g/15mL	20	
CUCCX25M25	5g/25mL	20	
CUCCX210M75	10g/75mL	10	
Hydrophobic plus Benzenesulfonic Acid			
CUBCX2L1	50mg/1mL	100	<p>% Organic Loading: 12.30</p> <p>Exchange Capacity (meq/g): 0.072</p> <p>Application: Dual functionality for weak base and hydrophobic compounds.</p>
CUBCX211	100mg/1mL	100	
CUBCX223	200mg/3mL	50	
CUBCX253	500mg/3mL	50	
CUBCX256	500mg/6mL	50	
CUBCX2M6	1g/6mL	30	
CUBCX21Z	100mg/10mL	50	
CUBCX22Z	200mg/10mL	50	
CUBCX25Z	500mg/10mL	50	
CUBCX22M15	2g/15mL	20	
CUBCX25M25	5g/25mL	20	
CUBCX210M75	10g/75mL	10	
Octadecyl plus Benzenesulfonic Acid			
CUBCX3L1	50mg/1mL	100	<p>% Organic Loading: 12.30</p> <p>Exchange Capacity (meq/g): N/A</p> <p>Application: Dual functionality for weak base and hydrophobic compounds.</p>
CUBCX311	100mg/1mL	100	
CUBCX323	200mg/3mL	50	
CUBCX353	500mg/3mL	50	
CUBCX356	500mg/6mL	50	
CUBCX3M6	1g/6mL	30	
CUBCX31Z	100mg/10mL	50	
CUBCX32Z	200mg/10mL	50	
CUBCX35Z	500mg/10mL	50	
CUBCX32M15	2g/15mL	20	
CUBCX35M25	5g/25mL	20	
CUBCX310M75	10g/75mL	10	

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Part Number	Sorbent Amount/ Tube Volume	Unit per Pack	Description
Hydrophobic plus N-2 Aminoethyl			
CUPSA2L1	50mg/1mL	100	<p>% Organic Loading: 9.70</p> <p>Exchange Capacity (meq/g): N/A</p> <p>Application: Scavenger for acids, cyclic compounds, cholesterol, and other lipid-type compounds.</p>
CUPSA211	100mg/1mL	100	
CUPSA223	200mg/3mL	50	
CUPSA253	500mg/3mL	50	
CUPSA256	500mg/6mL	50	
CUPSA2M6	1g/6mL	30	
CUPSA21Z	100mg/10mL	50	
CUPSA22Z	200mg/10mL	50	
CUPSA25Z	500mg/10mL	50	
CUPSA22M15	2g/15mL	20	
CUPSA25M25	5g/25mL	20	
CUPSA210M75	10g/75mL	10	
Octadecyl plus N-2 Aminoethyl			
CUPSA3L1	50mg/1mL	100	<p>% Organic Loading: 9.70</p> <p>Exchange Capacity (meq/g): N/A</p> <p>Application: Scavenger for acids, cyclic compounds, cholesterol, and other lipid-type compounds.</p>
CUPSA311	100mg/1mL	100	
CUPSA323	200mg/3mL	50	
CUPSA353	500mg/3mL	50	
CUPSA356	500mg/6mL	50	
CUPSA3M6	1g/6mL	30	
CUPSA31Z	100mg/10mL	50	
CUPSA32Z	200mg/10mL	50	
CUPSA35Z	500mg/10mL	50	
CUPSA32M15	2g/15mL	20	
CUPSA35M25	5g/25mL	20	
CUPSA310M75	10g/75mL	10	
Hydrophobic plus Quaternary Amine			
CUQAX2L1	50mg/1mL	100	<p>% Organic Loading: 13.60</p> <p>Exchange Capacity (meq/g): 0.160</p> <p>Application: Dual functionality for weak acids and hydrophobic compounds.</p>
CUQAX211	100mg/1mL	100	
CUQAX223	200mg/3mL	50	
CUQAX253	500mg/3mL	50	
CUQAX256	500mg/6mL	50	
CUQAX2M6	1g/6mL	30	
CUQAX21Z	100mg/10mL	50	
CUQAX22Z	200mg/10mL	50	
CUQAX25Z	500mg/10mL	50	
CUQAX22M15	2g/15mL	20	
CUQAX25M25	5g/25mL	20	
CUQAX210M75	10g/75mL	10	

CLEAN-UP[®] Copolymeric Extraction Columns

Part Number	Sorbent Amount/ Tube Volume	Unit per Pack	Description
Hydrophobic plus Aminopropyl			
CUNAX2L1	50mg/1mL	100	% Organic Loading: 12.3 Exchange Capacity (meq/g): 0.163 Application: Dual functionality for strong acids and hydrophobic compounds.
CUNAX211	100mg/1mL	100	
CUNAX223	200mg/3mL	50	
CUNAX253	500mg/3mL	50	
CUNAX256	500mg/6mL	50	
CUNAX2M6	1g/6mL	30	
CUNAX21Z	100mg/10mL	50	
CUNAX22Z	200mg/10mL	50	
CUNAX25Z	500mg/10mL	50	
CUNAX22M15	2g/15mL	20	
CUNAX25M25	5g/25mL	20	
CUNAX210M75	10g/75mL	10	