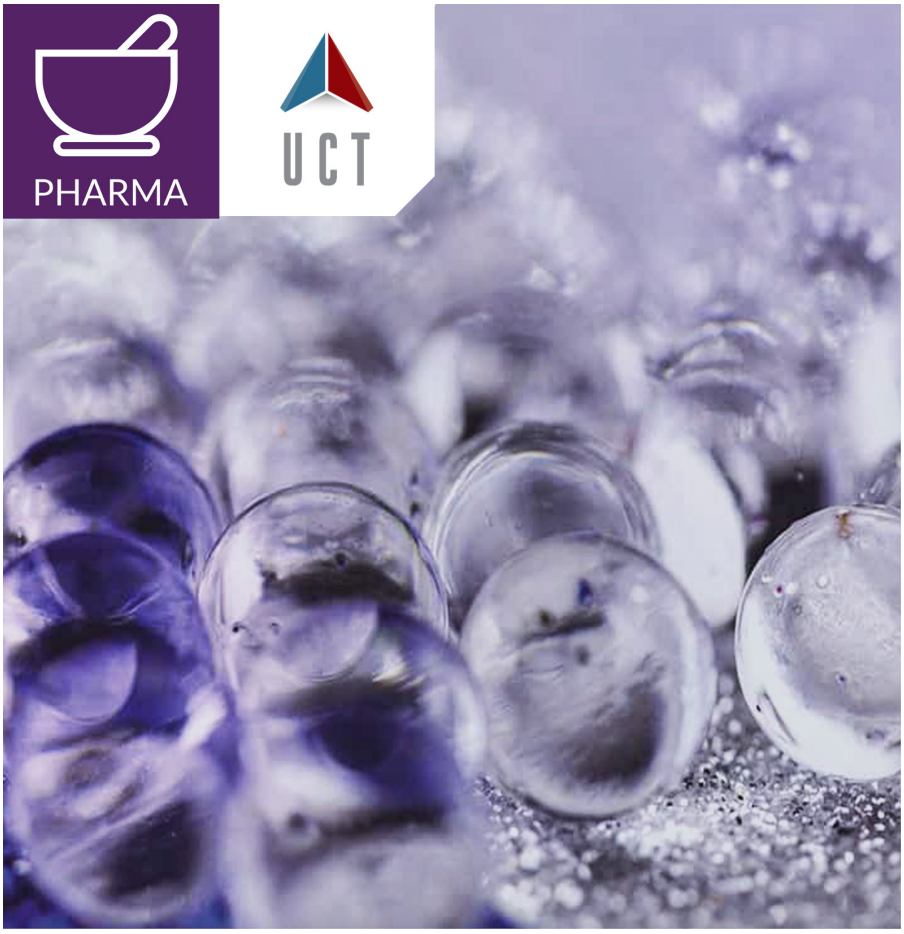
PHARMA

UCT

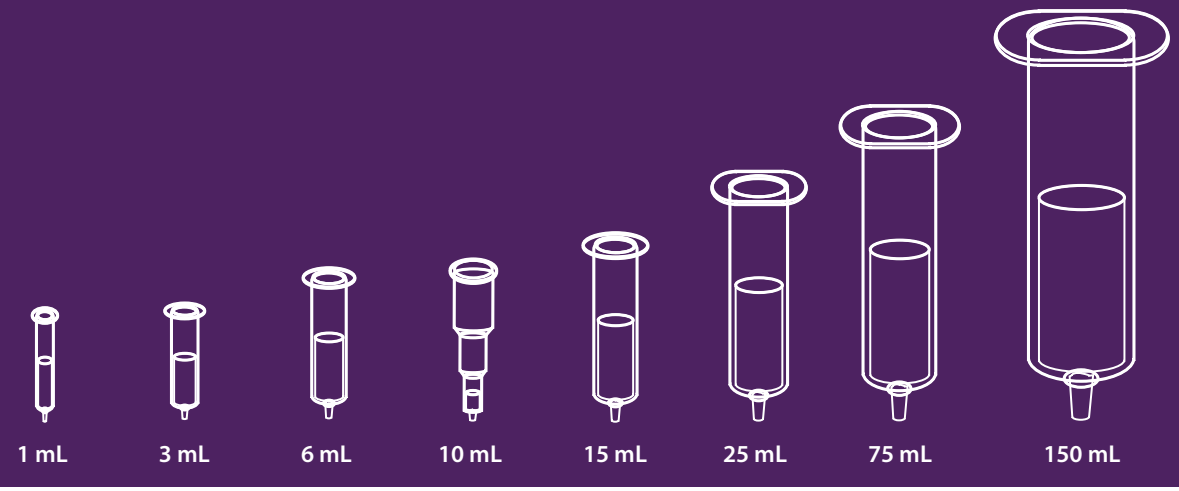


FUNCTIONALIZED SILICA PHASES

UNITED CHEMICAL TECHNOLOGIES | INNOVATION THROUGH CHEMISTRY

CLEAN-UP®

RESERVOIRS FOR BONDED PHASE EXTRACTIONS

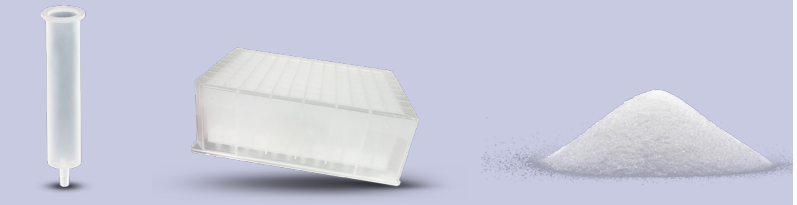


CHEMISTRIES OFFERED ON DIFFERENT SILICA PARTICLE SIZES

SMALL PARTICLE (5-20 µm)

STANDARD PARTICLE (40-60 µm)

LARGE PARTICLE (120-200 µm)



Volume Capacity (mL)	Tube Configuration	Bed Diameter (mm)	Sorbent Mass (mg)
1	Cylindrical	5.5	50-200
3	Cylindrical	8.5	50-1000
6	Cylindrical	12.5	200-2000
10	Expanded	8.5	50-1000
15	Cylindrical	15.5	500-2000
25	Cylindrical	20	500-5000
75	Cylindrical	27.5	1000-10000
150	Cylindrical	38.0	1000-70000

SOLID PHASE SORBENT SELECTION

Organic Loading & Exchange Capacity

Hydrophobic Phases

SORBENT	STRUCTURE	% Organic Loading
C2 ethyl	-$SiCH_2CH_3$	6.60
C4 n-butyl	-$Si\text{-}(CH_2)_3CH_3$	8.50
C8 octyl	-$Si\text{-}(CH_2)_7CH_3$	11.10
C18 octadecyl	-$Si\text{-}(CH_2)_{17}CH_3$	21.70
C30 tricontyl	-$Si\text{-}(CH_2)_{29}CH_3$	26.00
Cyclohexyl	-Si 	11.60
Phenyl	-Si	11.00

Hydrophilic Phases

Silica	-SiOH	N/A
Diol	-$Si\text{-}(CH_2)_3OCH_2CHOHCH_2OH$	8.00
Cyanopropyl	-$Si\text{-}(CH_2)_3CN$	6.90
Florisil®		N/A
Alumina-Acid		N/A
Alumina-Neutral		N/A
Alumina-Base		N/A
Carbon		N/A

Metal Scavengers

Thiopropyl High Load	-SiOH	13.5
Tri-Acetic Acid	-$Si\text{-}(CH_2)_3OCH_2CHOHCH_2OH$	7.61
Aminopropyl	-$Si\text{-}(CH_2)_3CN$	6.65
Triamine	-$Si\text{-}(CH_2)_3NH(CH_2)_2NH(CH_2)NH_2$	13
Thiourea	-$Si\text{-}NH\text{-}C(S)NH_2$	10.5

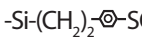
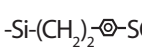
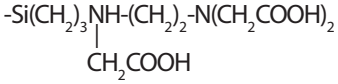
SOLID PHASE SORBENT SELECTION

Organic Loading & Exchange Capacity

Ion Exchange - Anion Extraction Phases

SORBENT	STRUCTURE	pKa	% Organic Loading	Exchange Capacity (meq/g)
Aminopropyl (1° amine)	$-Si(CH_2)_3NH_2$	9.8	6.65	0.310
N-2 Aminoethyl (1° & 2° amine)	$-Si(CH_2)_3NH(CH_2)_2NH_2$	10.1, 10.9	9.70	0.320
Diethylamino (3° amine)	$-Si(CH_2)_3N(CH_2CH_3)_2$	10.6	8.40	0.280
Triamine (1° & 2° amines)	$-Si(CH_2)_3NH(CH_2)_2NH(CH_2)_2NH_2$	10.75	13.5-15	1.2
Quaternary Amine with Chloride counter ion	$-Si(CH_2)_3N^+(CH_3)_3\ Cl^-$	Always Charged	8.40	0.250
Quaternary Amine with Acetate counter ion	$-Si(CH_2)_3N^+(CH_3)_3\ \ CH_3CO_2^-$	Always Charged	8.40	0.250
Quaternary Amine with Hydroxide counter ion	$-Si(CH_2)_3N^+CH_3)_3\ OH^-$	Always Charged	8.40	0.250
Quaternary Amine with Formate counter ion	$-Si(CH_2)_3N^+(CH_3)_3\ CHO_2^-$	Always Charged	8.40	0.250
Polyimine	$-Si(CH_2)_3$-R-$[NHCH_2CH_2]_X$	Always Charged	13.5	0.85

Ion Exchange - Cation Extraction Phases

SORBENT	STRUCTURE	pKa	% Organic Loading	Exchange Capacity (meq/g)
Carboxylic Acid	$-SiCH_2COOH$	4.8	9.10	0.170
Propylsulfonic Acid	$-Si(CH_2)_3SO_3H$	<1	7.10	0.180
Benzenesulfonic Acid		Always Charged	11.00	0.320
Benzenesulfonic Acid High Load		Always Charged	15.00	0.650
Triacetic Acid			7.61	Anion 0.17 Cation 0.06

SOLID PHASE SORBENT SELECTION

Organic Loading & Exchange Capacity

Copolymeric (Multifunctional Phases)

SORBENT	STRUCTURE	% Organic Loading	Exchange Capacity (meq/g)
Aminopropyl + C8	$-Si(CH_2)_3NH_2$ & $-Si(CH_2)_7CH_3$	12.3	0.163
Quaternary Amine + C8	$-Si(CH_2)_3N+(CH_3)_3$ & $-Si(CH_2)_7CH_3$	13.60	0.160
Carboxylic Acid + C8	$-SiCH_2COOH$ & $-Si(CH_2)_7CH_3$	12.50	0.105
Benzenesulfonic Acid + C8	$-Si-(CH_2)_2-C_6H_4-SO_3H$ & $-Si-(CH_2)_7CH_3$	12.30	0.072

Covalent Phases

SORBENT	STRUCTURE	% Organic Loading
Aldehyde	$-Si(CH_2)_4CHO$	N/A
Isocyanate	$-Si(CH_2)_3NCO$	7.1
Thiopropyl High Load	$-Si(CH_2)_3SH$	13.5

CLEAN-UP®

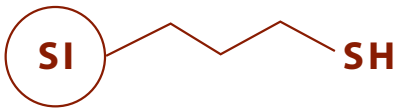
UCT Clean-Up® Metal Scavenging Sorbent Table																				
	Metals																			
Sorbent	Ag	As	Cd	Co	Cr	Cu	Fe	Hg	Ir	Ni	Os	Pb	Pd	Pt	Rh	Ru	Sc	Se	Sn	W	Zn
BCX-HL					■	■		■						■					■		■
CCX		■			■	■		■						■			■	■	■		■
DMT			■	■		■	■		■	■	■		■	■	■	■	■				■
NAX		■			■	■		■						■				■	■		■
PSA		■	■	■	■	■	■	■		■				■		■	■	■	■	■	■
TAX					■	■		■						■					■		■
THX	■	■			■	■		■	■		■	■	■	■	■	■		■	■		■

Preferred Scavengers: ■

Scavengers: □

BCX-HL	Benzene Sulfonic Acid Highload	**PSA**	Primary/Secondary Amine
CCX	Carboxylic Acid	**TAX**	Triacetic Acid
DMT	Dimercaptotriazine	**THX**	Thiopropyl
NAX	Aminopropyl		

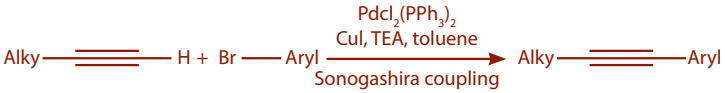
UCT - Metal Scavenging Thiopropyl



Loading: 1.6 mmol/g
Surface Area: 500 m^2/g
Average Pore Size: 60Å
Pore Volume: 0.77 cm^3/g

Metals Targeted
Best Metals Scavenged: Ag, Hg, Os, Pd & Ru
Good Metals Scavenged: Cu, Ir, Pb, Rh & Sn

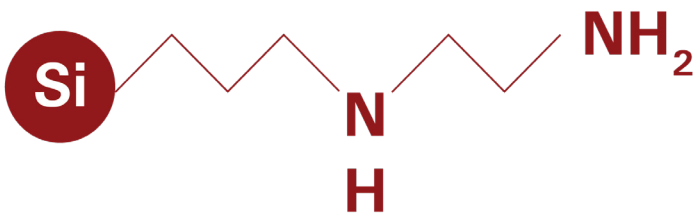
Case Study: Removal of Palladium from Sonogashira Coupling Reaction Using Various Metal Scavengers



Scavenger name	Pd in toluene solution (ppm)	Pd with respect to substrate (ppm)
No Scavenger (Control)	45.0	1800
UCT Silica Thiopropyl	< 3	< 120
UCT Silica Triamine	3.9	156
Competitor 1 MTcf	< 3	< 120
Competitor 1 SPM32-f	3.0	120
Competitor 1 SPM32	< 3	< 120
Competitor 1 SPM36-f	4.9	196
Competitor 1 SEM 26	4.0	160
Competitor 1 SPM36	6.7	268
Competitor 1 SEA	4.7	188
Competitor 1 STA 3	4.9	196
Competitor 2 MP	5.4	216
Competitor 2 TA	6.2	248
Competitor 2 AP	4.4	176
Competitor 3 Thiourea	< 3	< 120
Competitor 3 -Thiol	5.0	200
Competitor 3 DMT	4.0	160
Competitor 3 diamine	7.4	296
Competitor 3 triamine	5.0	200
Competitor 4 -TU	20.5	820
Competitor 4-BZA	16.2	648
Competitor 5 SA-FC Si-1	8.6	344
Competitor 5 SA-FC Si-3	11.1	444

CLEAN-UP®

UCT's Clean-Up® – Metal Scavenging Primary/Secondary Amine (PSA)

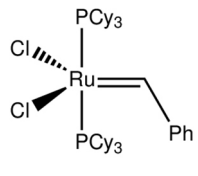


Organic Loading: ≥ 0.80 mmol/gm
Surface Area: 500 m^2/g
Average Pore Size: 60Å
Pore Volume: 0.77 cm^3/g

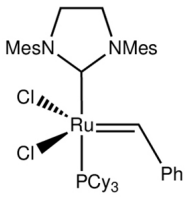
Metals Targeted
Best Metals Scavenged: Cr, Pd, Pt, Ru, W, & Zn
Good Metals Scavenged: Cd, Co, Cu, Fe, Hg, Ni, Pb, Se, & Sc

Olefin metathesis has become a well-established synthetic technique for the clean development of innumerable classes of chemical structures. Ruthenium-based catalysts are traditionally the go-to in the aforementioned reactions (ROM(P) and RCM), where a majority of the successful examples in the below reaction are achieved via Grubbs and Hoveyda-Grubbs catalysts. In order to successfully reach the maximum tolerated concentrations of residual ruthenium, various functionalized silica based sorbents were evaluated for their scavenger efficiency.

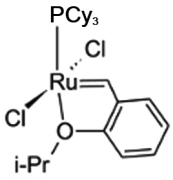
Case Study: Removal of Palladium from Sonogashira Coupling Reaction Using Various Metal Scavengers



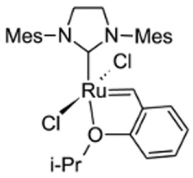
Grubbs
1st Generation



Grubbs
2nd Generation



Hoveyda-Grubbs
1st Generation



Hoveyda-Grubbs
1st Generation

Case Study: Removal of Residual Ruthenium Concentrations Using 3 Different Metal Scavengers

Initial Ru (ppm)	Scavengers	Conditions	# of treatment	Ru (ppm)	% Yield of API
2000	Competitor 1 - Diamine	20 wt%, THF, RT, 16 h	Pass 1	950	~95.4
			Pass 2	710	
			Pass 3	600	
2000	UCT PSA	20 wt%, THF, RT, 16 h	Pass 1	800	~99.8
			Pass 2	390	
			Pass 3	340	
2000	Competitor 2- Complex Amine Resin	20 wt%, THF, RT, 16 h	Pass 1	1300	~92.8
			Pass 2	1100	

CLEAN-UP®

PRICES AND TERMS

Our prices are subject to change without notice. The price in effect when we receive your order will apply. All prices are in US Dollars and are F.O.B. Lewistown, PA 17044. Terms of payment are net 30 days.

MINIMUM ORDERS

We welcome all orders, therefore, we do not have a minimum order requirement. When ordering, please include your purchase order number, complete "Ship To" and "Bill To" address, catalog number, quantity, and description of product(s). Also include your name and a phone number where you can be reached should we have any questions concerning your order.

SHIPMENTS

Normal processing is within 24 hours after receipt of an order. Unless special shipping requests have been made, our trained staff will send all orders by UPS Ground service. The appropriate shipping charges (freight & insurance costs) will be added to the invoice, unless otherwise instructed by the customer.

SPECIAL PRICING

We offer special pricing for volume purchases and standing orders. These discounts apply to bonded phase extraction column purchases only. Please call a sales representative for more information on special pricing qualifications.

RETURN POLICY

Our Quality Manager will handle all returns. Before returning merchandise, please call to obtain a return authorization number from the quality manager. We will need to know the reason for the return, date of purchase, purchase order number and invoice number in order to issue a return authorization number. Return merchandise must be received before a credit can be issued. Returns will not be accepted after 90 days. A restocking fee of 25% of the price paid, or a minimum of $25.00 (whichever is greater) will be charged on all returns.

WARRANTY

All products manufactured by UCT are guaranteed against defects in materials and workmanship for a period of 90 days after shipment. UCT will replace any items that prove to be defective during this time period. The exclusive remedy requires the end user to first advise UCT of the defective product by phone or in writing and must include order number, the lot number and the shipping date.

To initiate this action, photographs of the product, including packaging and labeling of the containers, must be submitted to the UCT Representative for approval. With approval a return authorization can be initiated, and must be received within 30 days. Once the materials arrive at UCT a further inspection of the materials must be completed and accepted by our Quality Manager prior to further action of credits or replacement. UCT's total liability is limited to the replacement cost of UCT products.

This warranty does not apply to damage resulting from misuse.

Placing An Order

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4101-02-02

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