

QuadraPure™ Metal Scavengers

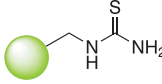
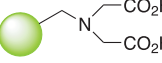
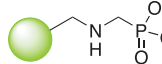
Application Guide

Sigma-Aldrich is pleased to announce an agreement with Reaxa Ltd. to distribute QuadraPure™ metal scavengers worldwide.

The QuadraPure™ range of functionalized macroporous and microporous resins are intended to solve problems associated with metal contamination arising during pharmaceutical or fine chemical processing from R&D scale through to manufacture. The very low levels of extractable impurities make QuadraPure™ products particularly suitable for use in GMP-compliant applications.

QuadraPure™ Metal Scavengers are available in 5g, 25g, 100g units, and bulk.

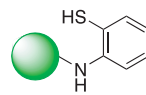
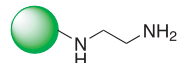
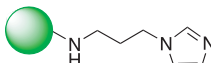
Macroporous

Prod. No.	Name	Structure	Typical Experimental Capacity	Metals Removed	Effective in acid/base
65,542-2	QuadraPure™ TU		0.19 mmol/g (based on Pd(OAc) ₂ in DCM)	Pd, Pt, Ru, Au, Ag, Cu(I), Hg, Pb, Cd, Ni	Y/Y
65,702-6	QuadraPure™ IDA		0.16 mmol/g (based on Cu(acac) ₂ in DCM)	Fe(III), Al(III), Ga(III), In(III), Cu, Va, Pb, Ni, Zn, Cd, Fe(II), Be, Mn, Ca, Mg, Sr, Ba	Y ^a /Y
65,761-1	QuadraPure™ AMPA		0.17 mmol/g (based on Ni(acac) ₂ in DCM)	Fe, Cu, Ni Multivalent metal ions, particularly transition metals	Y ^a /Y

^apH <2 gives poorer scavenging

Microporous

The microporous resins demonstrate excellent scavenging properties, particularly for palladium, at different pH values, and in the presence of competing ligands and substrates. Metal loading capacity can be significantly higher for these microporous products.

Prod. No.	Name	Structure	Functional Group Loading	Metals Removed	Effective in acid/base
65,766-2	QuadraPure™ MPA		1.5 mmol/g	Pd, Ru, Rh, Hg, Au, Ag, Cu(I), Hg, Pb, Ir, Pt and Cd	Y/Y
65,764-6	QuadraPure™ AEA		1.3 mmol/g	Pd + many multivalent transition metals	N/Y
65,765-4	QuadraPure™ IMDAZ		1.5 mmol/g	Pd, Os, Co + many multivalent transition metals	N/Y



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QuadraPure is a trademark of Reaxa Ltd.

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To inquire about bulk quantities for any of the products listed above, please call 800-244-1173 (USA) or visit us at www.safcglobal.com.

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Scavenging Capabilities of QuadraPure™

Macroporous and Microporous Resins

Palladium Salt Removal Using QuadraPure™ Resins

QuadraPure™	Palladium Removal (%)				
	Pd(OAc) ₂ in DCM	Pd ₂ (dba) ₃ in DCM	Pd(OAc) ₂ in DMF	Pd(OAc) ₂ in THF	Pd(OAc) ₂ in DCM/Et ₃ N
TU ^a	>99.9	>99.5	99.7	>99.9	95.3
AEA ^b	99.6	99.4	97.1	98.2	97.7
IMDAZ ^b	>99.9	>99.5	>99.9	99.9	95.2
MPA ^b	>99.8	>99.5	99.8	>99.9	95.9

QuadraPure™	Palladium Removal (%)				
	Pd(OAc) ₂ in DCM/AcOH	Pd(OAc) ₂ /PPh ₃ in DCM	PdCl ₂ in THF	PdCl ₂ in Aq. HCl	Pd(OAc) ₂ in Water
TU ^a	>99.7	34.8	99.2	>99.6	97.6
AEA ^b	0	77.7	96.2	-	-
IMDAZ ^b	53.7	68.1	89.3	-	-
MPA ^b	99.8	99.4	5.5	-	-

Nickel Salt Removal Using QuadraPure™ Resins

QuadraPure™	Initial Ni Content ^c (ppm)	Final Nickel Content (ppm)	% Removal from solution
TU ^a	370	<1	>99.9
IDA ^a	370	<1	>99.9
AMPA ^a	370	<1	>99.9
IMDAZ ^b	370	<1	>99.9

Notes:

- ^a Macroporous resin
- ^b Microporous solvent swellable resin
- ^c Nickel acetyl acetonate in DCM
- QuadraPure™ TU, 0.5g resin used per 10ml of 1000ppm solution
- For QuadraPure™ AEA, MPA and IMDAZ four molar equivalents of resin functionality used on palladium.
- In these experiments the QuadraPure™ is simply added to a stirred solution of the palladium salt at room temperature. Higher efficiency would be expected in a flow through mode (cartridge packed with QuadraPure™).
- Higher rates of Pd removal can be achieved by using warm solutions.

Guidance for Batch Process Use of QuadraPure™ TU:

Organic Solution: In organic solutions the resin may be used directly. Simply add 5g of resin per 100ml of 1000ppm solution and leave to gently agitate at room temperature for 3 to 6 hours (in some solvents the reaction may require much less time). The resin may then be removed by filtration. The rate of removal can be increased by adding more resin, increasing the temperature or by increasing the agitation rate.

Aqueous Solutions: If the metal is to be removed from an aqueous system, use 5g of resin per 100ml of 1000ppm solution. Wet the resin with methanol (3-4 ml/g dry resin) prior to addition. Gently agitate at room temperature for 16-24 hours (in some solvents the reaction may require less time) and then remove the resin by filtration.



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