

---

**DIAION<sup>TM</sup>**  
**RELITE<sup>TM</sup>**  
**SEPABEADS<sup>TM</sup>**  
**MCI GEL<sup>®</sup>**  
**MabSpeed<sup>TM</sup> & ChromSpeed<sup>TM</sup>**

**2014 Industrial and Preparative  
Resin Catalog**

# Table of Contents

## Ion Exchange Resins

Strongly Acidic Cation Exchange Resins	3
Strongly Basic Anion Exchange Resins	5
Weakly Acidic Cation Exchange Resins	7
Weakly Basic Anion Exchange Resins	8
Chelating Resins	9
Ultrapure Ion Exchange Resins	10
Water Treatment Resin	12
Fractionation Resins for Industrial Chromatography	14
Preparative Ion Exchange Resins	15

## Strong Acid Catalysts

Strongly Acidic Catalyst Resins	16
---------------------------------	----

## Synthetic Adsorbents

Synthetic Adsorbents	17
Synthetic Adsorbents for Industrial Chromatography	18
Styrenic Reverse Phase Resin	19
Methacrylic Reverse Phase Resins	20

## Bioseparations

Wide Pore Hydrophilic Ion Exchange Resins	21
NEW: Affinity Resins for Antibody Purification	22
Hydrophilic Aqueous Gel Filtration Resins	23
Remarks in Handling Ion Exchange Resins	24

Written By  
© ITOCHU Chemicals America, Inc. 2014

## **Strongly Acidic Cation Exchange Resins**

These are the resins of cross linked polystyrene matrix having sulfonic acid groups. There are SK-grade of gel type and PK-grade of porous type. The standard shipping form is sodium salt. In some cases, the hydrogen form is available for demineralization applications.

SK1B resin is our “flagship” premium grade, gel-type, strong acid cation resin. It has excellent properties for industrial applications and is recommended for industrial scale softening and demineralization applications. It has standard crosslinkage. In situations where the raw water contains oxidizing substances, the higher crosslinkage resins such as SK110 and SK112 are recommended to provide better performance and longer operating life. SK110 is also recommended for regenerable mixed bed applications. SK104H (4%) has low crosslinkage. It is mainly used in special applications where low crosslinked density is necessary to allow penetration of large organic molecules, or where faster removal rate is required.

The PK resin grades are based on a porous styrene DVB polymer matrix. Their porous structure provides excellent durability against osmotic shock by swelling and shrinkage. PK216 is recommended for general water treatment. PK228 is recommended for condensate demineralization (L grade is recommended for best pressure flow performance). PK grades are also recommended for special applications such as deashing, decolorization...

<b>Grades</b>	<b>SK104H</b>		<b>SK1B*</b>		<b>SK110*</b>		<b>SK112</b>	
Brand Name	Diaion							
Matrix type	Gel (styrene, DVB) :				R-SO <sub>3</sub> <sup>-</sup> Na <sup>+</sup>			
Counter Ion	Na <sup>+</sup> for standard form, H <sup>+</sup> for catalyst applications and demineralization							
Total Capacity (meq/ml-R)	>1.1	H form	>2.0	Na form	>2.0	Na form	>2.1	Na form
			>1.7	H form				
Water Retention (%)	62-72	H form	43-50	Na form	35-45	Na form	32-42	Na form
			50-60	H form				
Shipping Density (grams/liter)	~ 740	H form	~ 825	Na form	~ 845	Na form	~ 855	Na form
			~ 780	H form				
Particle Size Distribution	On 1180 µm: 5% max Through 300 µm: 1% max							
Effective Size (mm)	0.40 min							
Uniformity Coefficient	1.6 max							
Whole Bead Count (%)	90% min							
Operating Temperature	120°C (H form, Na form) max							
Crosslinked	4%		8%		10%		12%	

<b>Grades</b>	<b>PK208*</b>		<b>PK212*</b>		<b>PK216*</b>		<b>PK220*</b>		<b>PK228*</b>	
Brand Name	Diaion									
Matrix type	Porous (styrene, DVB) :					R-SO <sub>3</sub> <sup>-</sup> Na <sup>+</sup>				
Counter Ion	Na <sup>+</sup> for standard form, H <sup>+</sup> for catalyst applications and demineralization									
Total Capacity (meq/ml-R)	>1.2	Na form	> 1.5	Na form	>1.75	Na form	>1.9	Na form	>2.05	Na form
	>1.0	H form			>1.6	H form			>1.9	H form
Water Retention (%)	58-68	Na form	52-58	Na form	46-52	Na form	41-47	Na form	37-43	Na form
	63-73	H form			50-60	H form			39-49	H form
Shipping Density (grams/liter)	~ 745	Na form	~ 765		~ 780	Na form	~ 790		~ 805	Na form
	~ 720	H form			~ 740	H form			~ 770	H form
Particle Size Distribution	On 1180 µm: 5% max Through 300 µm: 1% max									
Effective Size (mm)	0.40 min									
Uniformity Coefficient	1.6 max									
Whole Bead Count (%)	95% min									
Operating Temperature	120°C (H form, Na form) max									
Crosslinked	4%		6%		8%		10%		14%	

\* Also available as L grades where the particle size thru 425 µm is 1% max.

## **More Strongly Acidic Cation Exchange Resins**

Ion exchange resins with good uniformity in particle size increase their necessity to reduce the reagents costs and spent waste waters in manufacturing pure waters. They are also used in other fields because they have little amount of large particles easy to be broken by swelling and shrinkage. Gel type UBK ion exchange resins of uniform particle size are now launched to meet such necessity. UBK16 has high (16%) crosslinkage. It is used for special process applications such as purification of pharmaceuticals.

<b>Grades</b>	<b>UBK08</b>	<b>UBK10</b>	<b>UBK12</b>	<b>UBK16</b>
Brand Name	Diaion			
Matrix type	Gel (styrene, DVB) : R-SO <sub>3</sub> <sup>-</sup> Na <sup>+</sup>			
Counter Ion	Na <sup>+</sup> for standard form, H <sup>+</sup> for catalyst applications and demineralization			
Total Capacity (meq/ml-R)	> 2.0 Na form > 1.8 H form	> 2.2 Na form > 1.9 H form	> 2.3 Na form > 1.9 H form	> 2.3 Na form > 2.3 H form
Water Retention (%)	43-50 Na form 47-54 H form	35-45 Na form 40-50 H form	33-39 Na form 36-46 H form	27-37 Na form 33-43 H form
Shipping Density (grams/liter)	~ 840 Na form	~ 850 Na form	~ 855 Na form	~ 865 Na form
Particle size Distribution	600 ± 50 µm Na 620 ± 50 µm H	580 ± 50 µm Na 590 ± 50 µm H	650 ± 50 µm Na 660 ± 50 µm H	600 ± 50 µm Na 610 ± 50 µm H
Effective Size (mm)	-			
Uniformity Coefficient	1.1 max			
Whole Bead Count (%)	90% min			
Operating Temperature	120°C (H form, Na form) max			
Crosslinked	8%	10%	12%	16%

## Strongly Basic Anion Exchange Resins

Diaion Strong base anion exchange resins are based on crosslinked polystyrene matrix having quaternary ammonium groups ( $\text{NR}_3^+$ ). Among the Diaion product line, there are SA-grades of gel type, PA-grades of porous type, and HPA-grades of highly porous-type. The standard shipping is  $\text{Cl}^-$  form (in some cases  $\text{OH}^-$  form is available). Type I resins have trimethyl ammonium groups which impart higher basicity. In the co-current regeneration mode, the treated water will have the lowest silica leakage. Type I resins also have higher chemical stability and can be applied at higher temperature than type II or acrylic based resins.

SA10A is a type I resin with standard crosslinkage. SA12A is a type I resin with slightly lower crosslinkage and typically recommended for treatment of surface waters with troublesome organic content. These resins are mainly used for water treatment. SA11A is type I resin with low crosslinkage used for special applications such as high organic removal or as a primary bed polisher anion. NSA100 is a gel type I resin with high crosslinkage. It is used for special applications such as iodine isolation from brine.

Porous-type ion exchange resins of porous polymer matrix have good resistance against swelling and shrinking, though their exchange capacity is lower than gel-type ion exchange resins of the same degree of crosslinkage. These are effective when highly purified effluents are needed, e.g. removal of silica to very low concentration. They are suitable for treatments of waste waters with organic compounds. PA312 and PA316 are generally used in waste water treatments, and PA308 is used for demineralization and decolonization of sugar liquors. HPA25L is typically used for treatment of large molecules in special process applications such as enzyme purification as enzyme carriers for treatment of biopharmaceutical substances, and treatment of feed solutions of high colors and tannins.

Ion Exchange resins with good uniformity particle size are necessary to reduce the reagents costs and spent waste waters in manufacturing pure waters. UBA100 and 120 are also used in other fields for their osmotic stability.

Grades	SA10A*	SA11A* <sup>1</sup>	SA12A* <sup>1</sup>	NSA100	UBA100	UBA120
Brand Name	Diaion					
Matrix type	Gel (styrene, DVB) :			$\text{R-CH}_2\text{-N(CH}_3)_3^+$		
Counter Ion	$\text{Cl}^-$ for standard form, $\text{OH}^-$ for catalyst applications and demineralization					
Total Capacity ( $\text{Cl}^-$ form) (meq/ml-R)	>1.3	> 0.85	>1.3		>1.35 (Cl) >0.9 (OH)	>1.3 (Cl) >0.9 (OH)
Water Retention (%) ( $\text{Cl}^-$ form)	43-47	55-65	48-55	37-44	43-50 (Cl) 55-65 (OH)	48-55 (Cl) 62-72 (OH)
Shipping Density (grams/liter) ( $\text{Cl}^-$ form)	~ 670	~ 685	~ 670	~ 685	~ 680 (Cl)	~ 675 (Cl)
Particle Size Distribution	On 1180 $\mu\text{m}$ : 5% max Through 300 $\mu\text{m}$ : 1% max				550 $\pm$ 50 (Cl) 580 $\pm$ 50 (OH)	575 $\pm$ 50 (Cl) 620 $\pm$ 50 (OH)
Effective Size (mm)	0.40 min				-	
Uniformity Coefficient	1.6 max				1.1 max	
Whole Bead Count (%)	90% min					
Operating Temperature	60°C (OH form) ---- 80°C (Cl form) max					

Grades	PA306S	PA308* <sup>1</sup>	PA312*	PA316	HPA25L	
Brand Name	Diaion					
Matrix type	Porous (styrene, DVB) :			$\text{R-CH}_2\text{-N(CH}_3)_3^+$		Highly Porous
Counter Ion	$\text{Cl}^-$ for standard form, $\text{OH}^-$ for catalyst applications and demineralization					
Total Capacity ( $\text{Cl}^-$ form) (meq/ml-R)	>0.8	>1.0	>1.2	>1.3	>0.5	
Water Retention (%) ( $\text{Cl}^-$ form)	66-76	57-67	49-55	44-50	58-68	
Shipping Density (grams/liter) ( $\text{Cl}^-$ form)	~ 645	~ 710	~ 675	~ 670	~ 680	
Particle Size Distribution	14% max >425 $\mu\text{m}$ 1% max <150 $\mu\text{m}$	On 1180 $\mu\text{m}$ : 5% max Through 300 $\mu\text{m}$ : 1% max			On 250 $\mu\text{m}$ : 95% min	
Effective Size (mm)	-		0.40 min		0.25 min	
Uniformity Coefficient	1.6 max					
Whole Bead Count (%)	95% min					
Operating Temperature	60°C (OH form) ---- 80°C (Cl form) max					
Crosslinked	3%	4%	6%	8%	High	

\* Also available as L grades where the particle size thru 425  $\mu\text{m}$  is 1% max.

1- Low-odor and low leachable anion exchange resins are available as F grade

## **More Strongly Basic Anion Exchange Resins**

Type II resins have dimethylethanol ammonium groups which impart slightly lower basicity. This provides an advantage of easier regeneration than type I and slightly higher capacity.

SA20A is type II gel resin of standard crosslinkage. It is popularly used for water treatment with its easy regeneration. SA21A is Type II resin of low crosslinkage and is used for special applications such as purifications of pharmaceuticals and food products. UBA200 is a uniform type 2 gel anion resin for better osmotic stability.

Porous-type type II resins have better efficiency during regeneration though they have lower basicity and chemical stability than type I. PA418 is generally used in water treatment while PA408 is used to demineralize and to decolorize sugar liquors.

<b>Grades</b>	<b>SA20A*</b>	<b>SA21A</b>	<b>UBA200</b>	<b>PA408</b>	<b>PA412*</b>	<b>PA418*<sup>1</sup></b>
Brand Name	Diaion					
Matrix type	Gel (styrene, DVB)			Porous (styrene, DVB)		
Functionality	R-CH <sub>2</sub> -N(CH <sub>3</sub> ) <sub>2</sub> (CH <sub>3</sub> CH <sub>2</sub> OH) <sup>+</sup> Cl <sup>-</sup> for standard form					
Total Capacity (Cl <sup>-</sup> form) (meq/ml-R)	>1.3	>0.8	>1.3	>0.9	>1.1	>1.3
Water Retention (%) (Cl <sup>-</sup> form)	45-52	55-65	45-52	54-64	46-52	38-44
Shipping Density (grams/liter) (Cl <sup>-</sup> form)	~ 715	~ 710	~ 715	~ 720	~ 685	~ 685
Particle Size Distribution	On 1180 μm: 5% max Through 300 μm: 1% max		575 ± 50	On 1180 μm: 5% max Through 300 μm: 1% max		
Effective Size (mm)	0.40 min		-	0.40 min		
Uniformity Coefficient	1.6 max		1.1 max	1.6 max		
Whole Bead Count (%)	90% min			95% min		
Operating Temperature	40°C (OH form) ---- 60°C (Cl form) max					
Crosslinked	-			4%	6%	9%

\* Also available as L grades where the particle size thru 425 μm is 1% max.

1- Low-odor and low leachable anion exchange resins are available as F grade

## **Weakly Acidic Cation Exchange Resins**

WK10 grades (methacrylic type) are weak acid cation exchange resins having carboxylic acid functionalities. They have a pK value of approximately 6. WK10 has high reaction rate, and WK11 has a high total exchange capacity. These methacrylic grades are mainly used for special applications such as purification of pharmaceuticals, foods, and organic chemicals.

WK100 and WT01S have high reaction rate and high adsorption capacity. They are mainly used for the purification of pharmaceuticals and foods. WT01S is offered in 100-300 µm particle distribution designed for high performance processing.

WK40L and WK60L are weak acid cation exchange resins with carboxylic acid functionality based on porous acrylic polymer matrix. They have a pK value of approximately 5.3. The acrylic type resins have higher total capacity than methacrylic type resins. They are mainly used for water treatment applications such as the removal of hardness ions in the presence of bicarbonate alkalinity.

<b>Grades</b>	<b>WK10</b>	<b>WK11</b>	<b>WK100</b>	<b>WT01S</b>	<b>WK40L</b>	<b>WK60L</b>
Brand Name	Diaion				Diaion	
Matrix type	Porous – Methacrylic				Porous – Acrylic	
Functionality	Carboxylic acid				Carboxylic acid	
Total Capacity (meq/ml-R)	>2.5	>2.9	>2.8	>3.0	>4.4	> 4.4
Water Retention (%)	53-59	45-52	45-55	45-55	41-48	44 -52
Shipping Density (grams/liter)	~ 635	~ 660	~ 660	~ 750	~ 765	~ 800
Particle Size Distribution	On 1180 µm: 5% max Through 300 µm: 1% max			(300-106 µm) – 85% min	On 1180 µm: 5% max Through 425 µm: 3% max	
Effective Size (mm)	0.40 min			0.10 - 0.14	0.45 min	
Uniformity Coefficient	1.6 max				1.6 max	
Whole Bead Count (%)	95% min				95% min	
Operating Temperature	150°C max				120°C max	
Effective pH range	5 - 14				4 - 14	

## Weakly Basic Anion Exchange Resins

WA10 resin is based on gel-type acrylic polymer matrix. It has tertiary amine functionality with high regeneration efficiency. The acrylic polymer matrix provides good chemical stability and good resistance to organic fouling. WA10 is mainly used for pretreatment of starch hydrolysates, beet sugar solutions, and formaldehyde.

WA20 and WA21J do not have any neutral salt splitting capacity. They have high total exchange capacity and high regeneration efficiency. The porous styrene polymer imports high chemical stability, high mechanical strength against attrition loss, high thermal stability, and high durability against organic fouling. These resins are used for the removal of strong mineral acids in standard water treatment applications. They can also be applied in special process separations such as the treatment of organic solvents.

WA30 resin is a weak base anion exchange resin based on porous, styrene-DVB polymer matrix with dimethyl amine functionality. The high porous styrenic matrix has excellent chemical stability, mechanical and osmotic strength, high thermal stability, and durability against organic fouling. WA30 is the bench mark which all macroporous weak base exchange resin are compared with. It is used for a variety of applications, such as removal of organic substances of high molecular weight, pretreatment of raw waters containing organic foulants, deionization and decolorization of starch hydrolysates, and purification of glycerine and enzymes.

WA55 is a unique weak anion resin to Mitsubishi Chemical where the total capacity is equally divided between strong base functionality (quaternary amine) and weak base functionality (tertiary amine). This resin is used in the production of demineralized whey enriched with proteins. With whey containing approximately 50 g/l lactose, proteins, beta-carotene, amino acids, organic acids and mineral salts, the anions and organic acids are removed by WA55 with a minimum loss of protein and reversible adsorption of beta-carotene.

Grades	WA10	WA20	WA21J	WA30	WA55
Brand Name	Diaion				
Matrix type	Gel – Acrylic		Porous – Styrene-DVB		
Functionality	$-\text{CONH}(\text{CH}_2)_n\text{N}(\text{CH}_3)_2$	$-\text{CH}_2\text{NH}(\text{CH}_2\text{CH}_2\text{NH})_n\text{H}$	$-\text{CH}_2\text{N}(\text{CH}_3)_2$		
Total Capacity (free base form) (meq/ml-R)	>1.2	>2.5	>2.0	>1.5	1.1-1.3
Water Retention (%)	63-69	41-47	40-52	43-55	60-65
Shipping Density (grams/liter)	~ 695	~ 660	~ 655	~ 635	~ 694
Particle Size Distribution	On 1180 $\mu\text{m}$ : 5% max Through 300 $\mu\text{m}$ : 1% max				
Effective Size (mm)	0.35 min	0.40 min			
Uniformity Coefficient	1.6 max				
Whole Bead Count (%)	90% min	95% min			90% min
Operating Temperature	60°C max	100°C max			60°C max
Effective pH range	0-9				
% Strong Base Capacity	0%			15%	50%
$\alpha$ -Lactic Acid Adsorption	-				1.0 g/L-R max



## Chelating Resins

Iminodiacetate Type: CR11 is based on a high porous styrenic matrix, and provides rapid kinetics, high operating capacity, low swell / shrink ratio, and excellent mechanical stability. CR11 captures metal ions by chelation with its iminodiacetate functionality. CR11 has a higher selectivity than strong and weak acid cation exchange resins for divalent ions, especially transitional metal elements such as copper, Iron, etc... CR11 can capture metal ions at much lower pH than strong and weak acid resins. As CR11 has higher selectivity for divalent metal ions than monovalents, it can be used for such selective separation.

Polyamine Type: CR20 is a special chelating resin with polyamine functionality. CR20 captures metal ions by chelation with its polyamine functionality with its high porous styrene-DVB matrix. CR20 has a high selectivity to heavy and transitional metal ions. It does not absorb alkali metal and alkali earth metal ions, and therefore, it can be used for heavy metal recovery from highly concentrated alkali earth solutions.

Glucamine Type: CRB03 and CRB05 are special chelating resin with glucamine groups based on a high porous styrene-DVB matrix. It has high selectivity for borate ions. It is used for borate separation from various solutions, including brine and sea water.

Grades	CR11	CR20	CRB03	CRB05
Brand Name	Diaion			
Matrix type	Porous – Styrene-DVB			
Functionality	$-\text{CH}_2\text{N}(\text{CH}_2\text{COONa})_2$	$-\text{CH}_2\text{NH}(\text{CH}_2\text{CH}_2\text{NH})_n\text{H}$	$-\text{CH}_2\text{N}(\text{CH}_3)\text{CH}_2(\text{CHOH})_4\text{CH}_2\text{OH}$	
Total Exchange Capacity (meq/ml-R)	-	-	>0.7	>0.95
Cu Adsorption Capacity (mmole/ml-R)	>0.5	>0.4	-	
Water Retention (%)	55-65	60-60	45-55	43-53
Shipping Density (grams/liter)	~ 730	~ 635	~ 665	~ 770
Particle Size Distribution	On 1180 $\mu\text{m}$ : 5% max Through 355 $\mu\text{m}$ : 2% max	On 1180 $\mu\text{m}$ : 5% max Through 300 $\mu\text{m}$ : 1% max		On 850 $\mu\text{m}$ : 10% max Through 300 $\mu\text{m}$ : 1% max
Effective Size (mm)	0.40 min		0.35-0.55	0.35 min
Uniformity Coefficient	1.6 max			
Whole Bead Count (%)	95% min			
Operating Temperature	80°C max (H form) 120°C max (Na form)	100°C max (free base)		

## Ultrapure Ion Exchange Resins

Mitsubishi Chemical offers several grades of mixed resin for non-regenerable mixed bed ion exchange applications. All mixed resins are typically offered in a 1:1 stoichiometric ratio (1 equivalence of cation equilibrium capacity to 1 equivalence of anion equilibrium capacity).

The Diaion SMNUPB mixed resin is offered for critical applications which require high purity treated water. This mixed resin is prepared from component resins which have been prepared with a high degree of purity and conversion to the H/OH form. Diaion SMNUPB is often supplied for applications which require nuclear grade resin.

SMT100L and SMT200L are manufactured to very stringent performance specifications, and prepared from component resins with the highest degree of conversion and considerations of purity. They will also provide exceptional performance relative to electrical resistivity and TOC leakage. In fact, rinse to 18 megaohm resistivity is near instantaneous, and clearly superior to conventional mixed bed resins. The performance for TOC meets or exceeds all conventional mixed bed resins. The TOC rinse down performance is maintained over 12 month's storage.

Diaion SMT200L also offers remarkable performance relative to metals leakage. The cation component, SKT20L, has been prepared with low levels of metals in the resin phase (500 ppb). This improvement allows ppt metals leakage in the product water quality (actual performance is <0.1 ppt for 13 metals within 4 hrs of rinse).

Grades	SMNUPB	SMT100L	SMT200L
Brand Name	Diaion		
Matrix type	Gel (styrene, DVB) with Ionic form H/OH		
Capacity (meq/ml resin)	>1.7 cation >0.9 anion		
Water Retention (%)	50-60 cation 55-65 anion	50-60 cation 62-72 anion	
Conversion (eq%)	>99 H form >90 OH form	>99.9 H form >90.0 OH form <1.0 Cl form	
Particle Size Distribution	On 1180 $\mu\text{m}$ : 5% max Through 300 $\mu\text{m}$ : 1% max		
Effective Size (mm)	0.40 min		
Uniformity Coefficient	1.6 max		
<b>Performance Properties*</b>			
Resistivity (m $\Omega$ . Cm)	>15 (5 min) >17.5 (30 min)	>18 (3 hrs)	>18.1 (12 hrs)
TOC (ppb)	-	<10 (3 hrs)	<10 (3 hrs)
Metal Water Quality (ppt)	-		<0.1 (12 hrs)
Particles (>0.05 $\mu\text{m}/\text{ml}$ )	-		<10 (12 hrs)

\*Test condition: Feed of 18.1 m  $\odot$  cm to 1500ml resin packed in 50mm  $\phi$  x 1000mmH column at SV 20. Resistivity measured by DKK: AQ-11; TOC by Anatel A-100PSE.

## **More Ultrapure Ion Exchange Resins**

Diaion SKT10L is a premium grade, gel-type strong acid cation exchange resin based on a crosslinked polystyrene matrix with sulfonic acid functional groups. Diaion SKT10L is prepared in the hydrogen form with special attention to resistivity rinse up, TOC and metal leachables. Diaion SKT10L is used as the cation component for Diaion SMT100 non-regenerable mixed bed resin. This ultra-high-purity mixed bed resin is recommended for semiconductor plant final polishing loop applications. An improved copolymerization process provides low level TOC leachables. SKT10L is remarkable for its extremely low content of ionic contaminants in the resin phase. Diaion SKT10L is recommended for critical applications requiring low metal leakage.

Diaion SAT10L is a premium grade, gel-type strong base, Type I, anion exchange resin based on a crosslinked polystyrene matrix with quaternary ammonium functional groups. Diaion SAT10L is prepared with an extremely high conversion to the hydroxide form with special attention to resistivity rinse up, TOC and metal leachables. Diaion SAT10L is used as the anion component for Diaion SMT100 non-regenerable mixed bed resin. This ultra-high-purity mixed bed resin is recommended for semiconductor plant final polishing loop applications. SAT10L is remarkable for its extremely low content of ionic contaminants in the resin phase. The method of preparation provides TOC leakage in the ppb range.

Diaion SKT20L is an improved version of Diaion SKT10L since it has been prepared with low levels of metals in the resin phase (500 ppb). This improvement allows ppt metals leakage in the product water quality (actual performance is <0.1 ppt for 13 metals within 4 hrs of rinse). Diaion SAT20L is an improved version of Diaion SAT10L since it has been prepared with low levels of metals in the resin phase (500 ppb). This improvement allows ppt metals leakage in the product water quality (actual performance is <0.1 ppt for 13 metals within 4 hrs of rinse).

<b>Grades</b>	<b>SKT10L</b>	<b>SAT10L</b>	<b>SKT20L</b>	<b>SAT20L</b>
Brand Name	Diaion			
Matrix type	Gel (styrene, DVB)			
Counter Ion	>99.9 H form	>90.0 OH form	>99.9 H form	>90.0 OH form
Total Capacity (meq/ml-R)	>1.7	>0.9	>1.7	>0.9
Water Retention (%)	50-60	62-72	50-60	62-72
Particle Size Distribution	On 1180 µm: 5% max Through 425 µm: 1% max			
Effective Size (mm)	0.45 min			
Uniformity Coefficient	1.6 max			
<b>Performance Properties*</b>				
Resistivity (m Ω. Cm)	>12 (3 hrs)	>15 (3 hrs)	>16 (12 hrs)	>18.1 (12 hrs)
TOC (ppb)	<20 (3hrs)	<20 (3hrs)	<5 (12 hrs)	<1.0 (12 hrs)
Metal Content (ppb/dry resin)			Na, Ca, Fe, Zn <1000	Na, Ca, Fe, Zn <1000

\* Single Bed with inlet water quality of 15m Ω • cm resistivity at Flow Rate: SV30

## Water Treatment Resins

The Relite brand resins were added to support the growing commodity water treatment business as well as other specialty applications.

The table below shows our strong cation exchangers that are offered to such industry.

JC600, JC610, JC660 have excellent properties for industrial application and are suitable for industrial scale softening and demineralization applications and other various uses such as catalyst, sugar processing, amino acid purification etc... JC603 is the hydrogen form resin for JC600. While the JC600 series are gel resins, JC700 are porous type resins that are suitable for water treatment, sugar processing, and other special chemical process applications.

Grades	JC600	JC603	JC660	JC703
Brand Name	Relite			
Matrix type	Gel styrene, DVB R-SO <sub>3</sub> <sup>-</sup> Na <sup>+</sup> <b>Strong Gel Cation - Sodium</b>	Gel styrene, DVB R-SO <sub>3</sub> <sup>-</sup> H <sup>+</sup> <b>Strong Gel Cation - Hydrogen</b>	Gel styrene, DVB R-SO <sub>3</sub> <sup>-</sup> Na <sup>+</sup> <b>Strong Gel Cation – Low Crosslinkage</b>	Porous styrene, DVB R-SO <sub>3</sub> <sup>-</sup> H <sup>+</sup> <b>Strong Porous Cation - Hydrogen</b>
Counter Ion	Na <sup>+</sup> for standard form, H <sup>+</sup> for catalyst applications and demineralization			
Total Capacity (meq/ml-R)	>2.0 Na form	> 1.8 H form	>1.8 Na form	>1.7 H form
Water Retention (%)	43-50 Na form	49-55 H form	50-55 Na form	54-57 H form
Particle Size Distribution	On 1180 µm: 5% max Through 300 µm: 1% max			
Effective Size (mm)	0.45 min			
Uniformity Coeff.	1.7 max			
Whole Bead Count	90% min			
Operating Temp.	120°C (H form, Na form) max			
Crosslinked	8%	8%	6%	6%

The table below shows our strong anion exchangers that are offered to such industry.

Relite JA100, JA200, and JA400 have excellent properties for industrial application and are suitable for industrial scale demineralization applications and other various uses such as organic trap, sugar processing, etc... JA100 is a gel type I strongly basic anion resin while JA200 is a gel type II strongly basic anion resin used in water treatment operation. JA400 is a porous type I strongly basic anion resin mainly for organic removal, water treatment, sugar processing, and other special chemical process applications.

Relite JA450 is a porous type I strongly basic anion resin which is suitable for removing nitrate ions from water for potable use.

Relite JA800 and JA830 are a high capacity, organic fouling resistant, gel, acrylic type I strongly basic anion resin used in all types of deionization systems and chemical process applications.

Grades	JA100	JA400	JA450	JA800	JA830	JA200
Brand Name	Relite					
Matrix type	Gel styrene- DVB Type I  <b>Strong Gel Anion Type I</b>	Porous styrene- DVB Type I  <b>Strong Porous Anion Type I</b>	Porous styrene- DVB Type I  <b>Nitrate Selective Anion</b>	Porous Acrylic- DVB Type I  <b>Strong Porous Acrylic Anion</b>	Gel Acrylic- DVB Type I  <b>Strong Gel Acrylic Anion</b>	Gel styrene- DVB Type II  <b>Strong Gel Anion Type II</b>
Counter Ion	Cl <sup>-</sup> for standard form					
Total Capacity (Cl form) (meq/ml-R)	>1.2	> 0.8	>0.9	>0.8	>1.2	>1.2
Water Retention (%) (Cl form)	48-54	57-66	45-55	65-72	55-65	45-51
Particle Size Distribution	On 1180 µm: 5% max Through 300 µm: 1% max					
Effective Size (mm)	0.45 min					
Uniformity Coefficient	1.7 max					
Whole Bead Count (%)	90% min	95% min				90% min
Operating Temperature	60°C (OH form)	---- 80°C (Cl form) max		40°C (OH form), 60°C (Cl form) max		

## [More Water Treatment Resins](#)

We also offer weak acid cation exchangers, weak base anion exchanger, and a phosphonic resin for your various commodity applications. Relite JC800 is a gel type weakly acidic cation exchange resin based on cross-linked polyacrylic matrix. It is suitable for applications such as metal recovery, waste water treatment, etc...

Relite JA300 is a weak base anion exchange resin based on high porous, styrene-DVB polymer matrix. JA300, like WA30, has tertiary amine functionality with high regeneration efficiency. The high porous styrenic matrix imparts excellent chemical stability, excellent mechanical and osmotic strength, high thermal stability, and excellent durability against organic fouling.

Aminophosphonic Type: Relite JS020 is an amino phosphonic exchange resin based on styrene-DVB polymer matrix. It is suitable for applications such as decalcification of secondary brine in the chloralkali industry.

Grades	JC800	JA300	JS020
Brand Name	Relite		
Matrix type	Gel – Acrylic	Porous – Styrene-DVB	
Functionality	Carboxylic acid <b>Weak Cation</b>	-CH <sub>2</sub> N(CH <sub>3</sub> ) <sub>2</sub> <b>Weak Anion</b>	-CH <sub>2</sub> NHCH <sub>2</sub> PO <sub>3</sub> Na <b>Phosphonic</b>
Total Capacity (meq/ml-R)	>4.0	>1.5	>2.0
Water Retention (%)	46-54	47-55	60-67
Shipping Density (grams/liter)	-	~ 650	~ 750
Particle Size Distribution	On 1180 µm: 5% max Through 300 µm: 2% max		
Effective Size (mm)	0.45 min		
Uniformity Coefficient	1.7 max		
Whole Bead Count (%)	90% min	95% min	90% min
Operating Temperature	120°C max	80°C max	75°C max (Na form)
Effective pH range	4-14	0-9	-

The strongly acidic gel cation exchangers can also be mixed with a strongly gel anion exchangers to produce our JM Mix bed series for the commodity water treatment market. Relite JM111 is a nuclear grade mixed ion exchange resin with indicator. It is a mixture of high purity and highly regenerated color indicating (green) JC600 and JA100 in 1:1 volume ratio.

Grades	JM111
Brand Name	Relite
Matrix type	Gel (styrene, DVB) with Ionic form H/OH <b>Mix Bed</b>
Capacity (meq/ml resin)	>1.9 cation >1.1 anion
Water Retention (%)	47-54 cation 46-52 anion
Conversion (eq%)	>99 H form >90 OH form
Particle Size Distribution	On 1180 µm: 5% max Through 300 µm: 1% max
Effective Size (mm)	0.40 min
Uniformity Coefficient	1.7 max
<b>Performance Properties*</b>	
Resistivity (m Ω. Cm)	>12 (30 min)
Main Application	Mixed Resin with Indicator

## Fractionation Resins for Industrial Chromatography

Chromatographic separation is widely industrialized in pharmaceuticals, fermentation, and food applications. Ion exchange resins of small particles with uniform particle size distribution are applied for these purposes. The smaller particles with the more uniform particle size distribution, the higher yields and purities can be obtained. These types of resins are suitable for industrial chromatography such as fructose/glucose separation...

Diaion UBK resin are prepared via monodispersed production technology, and offered with narrow particle size distributions in either sodium or calcium form. The high bead uniformity provides fractionation resins with excellent resolving power and mechanical stability. These products are often applied in simulated moving beds (SMB) equipment with 4 to 8 column design for separation of binary and ternary mixtures in both small and large scale industrial applications.

The UMA series are strong base anion exchange resins, gel type, based on styrene-DVB polymer matrix, manufactured with Mitsubishi Chemical most up-to-date technology. These resins are used in special application such as the biomass industry for salt retardation. Due to their high uniformity, the UMA series offer excellent fractionation and great osmotic stability.

Grades	UBK510L	UBK530	UBK535	UBK550	UBK555
Brand Name	Diaion				
Matrix type	Gel (styrene, DVB) :			R-SO <sub>3</sub> <sup>-</sup>	
Counter Ion	Na <sup>+</sup> form		Ca <sup>+</sup> form	Na <sup>+</sup> form	Ca <sup>+</sup> form
Total Capacity (meq/ml-R)	>1.2	> 1.6		>1.9	>2.0
Water Retention (%)	61-65	52-56	48-52	46-50	42-46
Shipping Density (grams/liter)	~ 780	~ 810	~ 845	~ 825 Na form	~ 865
Particle Size	L grade – 320 μm K grade – 350 μm G grade – 390 μm	Standard-220 μm J grade – 280 μm L grade – 320 μm K grade – 350 μm G grade – 390 μm	Standard-220 μm J grade – 280 μm L grade – 320 μm	Standard-220 μm K grade – 350 μm G grade – 390 μm	Standard-220 μm K grade – 350 μm
Uniformity Coefficient	1.1 max				
Whole Bead Count (%)	90% min				
Operating Temperature	120°C max				
Crosslinked	4%	6%	6%	8%	8%

Grades	UMA150	UMA130J	UMA130K
Brand Name	Diaion		
Matrix type	Gel (styrene, DVB) :		R-CH <sub>2</sub> -N(CH <sub>3</sub> ) <sub>2</sub> <sup>+</sup>
Counter Ion	Cl <sup>-</sup> for standard form		
Total Capacity (meq/ml-R)	>1.35		
Water Retention (%)	43-53		
Particle Size	220 μm	280 μm	350 μm
Effective Size (mm)	-		
Uniformity Coefficient	1.1 max		
Whole Bead Count (%)	95% min		
Operating Temperature	60°C (OH form) ---- 80°C (Cl form) max		

## Preparative Ion Exchange Resins

The CK grade resins are based on a crosslinked polystyrene matrix having sulfonic acid groups with a sodium counter-ion for easy substitution. With varying the crosslinking degree or the DVB content (divinyl-benzene ratio) and the bead size of these resins, one can control the efficiency and the resolution in the separation of amino-acids, carbohydrates, sugars, organic acids and amines etc... These styrenic matrices have excellent mechanical strength with wide range pH stability (1 to 14) and resistance to high temperatures (up to 120 °C operating temperature).

Grades	CK02A	CK08Y	CK08P	CK10Y
Brand Name	MCI GEL			
Matrix type	Gel			
Counter Ion	Na <sup>+</sup>		H <sup>+</sup>	Na <sup>+</sup>
Total Capacity	>0.5 meq/ml	>1.9 meq/ml	>1.9 meq/ml	>2.0 meq/ml
Crosslinked	2%	8%	8%	10%
Mean size	20 µm	25 µm	110 µm	25 µm
Particle range	16 – 24 µm	20 – 30 µm	75 – 150 µm	20 – 30 µm
Column Dimension	20 x 250 mm	None		
Packing size*	10 grams	50, 300 g	100 ml	50 g
Typical usage	Oligosaccharide	Sugars, Carboxylic acids	Sugars, Carboxylic acids	Amino Acids

The CA grade resins are based on a crosslinked polystyrene matrix having quaternary amine groups (trimethyl amine) with a chloride counter-ion for easy substitution. With varying the crosslinking degree or the DVB content (divinyl-benzene ratio) and the bead size of these resins, one can control the efficiency and the resolution in the separation of nucleotides, carbohydrates, sugars, carboxylic acids and anionic substances (e.g. Humic) etc... These styrenic matrices have excellent mechanical strength with wide range pH stability (1 to 14) and resistance to high temperatures (up to 60 °C operating temperature).

Grades	CA08Y	CA08P
Brand Name	MCI GEL	
Matrix type	Gel	
Counter Ion	Cl <sup>-</sup>	
Total Capacity	>1.2 meq/ml	>1.3 meq/ml
Crosslinked	8%	8%
Mean size	25 µm	110 µm
Particle range	20 – 30 µm	75 – 150 µm
Column Dimension	None	
Packing size*	50 g	100 ml
Typical usage	Sugars, Carboxylic acids	Sugars, Carboxylic acids

\*Larger packing sizes are available as custom packing

- Note:
- a) The above products are available in uniform bead sizes of 220 µm as well as bead sizes > 250 µm for large industrial applications.
  - b) The above products are available in uniform bead sizes < 10 µm which are available in bulk or HPLC columns for small analytical applications. Please request our MCI GEL catalog of these analytical resins.

## Strongly Acidic Catalyst Resins

These are the hydrogen form of our strongly acidic cation resins which are used in catalysis. There are SK-grade of gel type, PK-grade of porous type, and RCP of highly porous type. The standard shipping form is hydrogen form as such counter ion is needed to run an effective solid phase acid catalysis.

The gel type SK catalysts can be used in aqueous reactions and where the hydrophilicity of the reaction medium is high such the esterification of methacrylic acid, ester hydrolysis, and esterification of acetic acids with methanol. Some special modification of these resins are also offered for high selectivity BPA formation.

The PK resin grades are based on a porous styrene DVB polymer matrix. Their porous structure provides excellent durability against osmotic shock by swelling and shrinkage. They can used in similar applications as the SK type in hydrophilic mediums but their porosity allow them to also work in non-aqueous mediums as well such as esterification of acetic acids with longer chain alcohols

Diaion RCP160M is based on a macroporous crosslinked polystyrene matrix with sulfonic acid functional groups. These matrices are more open and porous than conventional grade resin with increased polymer surface available for intimate contact with solutes. In catalysis, the reaction rates are faster with RCP160M than standard grade resins, resulting in a higher degree of conversion during catalytic applications. It is also the preferred resin in non-aqueous reactions such as the hydration of olefins and alkylation of phenols.

Grades	SK104H	SK1BH	PK208LH	PK216LH	PK228LH
Brand Name	Diaion				
Matrix type	Gel (styrene, DVB) : R-SO <sub>3</sub> <sup>-</sup> H <sup>+</sup>		Porous (styrene, DVB) : R-SO <sub>3</sub> <sup>-</sup> H <sup>+</sup>		
Counter Ion	H <sup>+</sup> for catalyst applications				
Total Capacity (meq/ml-R)	>1.1 H form	>1.7 H form	>1.0 H form	>1.6 H form	>1.9 H form
Water Retention (%)	62-72 H form	50-60 H form	63-73 H form	50-60 H form	39-49 H form
Shipping Density (grams/liter)	~ 740 H form	~ 780 H form	~ 720 H form	~ 740 H form	~ 770 H form
Particle Size Distribution	Through 300 µm: 1% max On 1180 µm: 5% max		Through 425 µm: 1% max On 1180 µm: 5% max		
Effective Size (mm)	0.40 min				
Uniformity Coefficient	1.6 max				
Whole Bead Count (%)	90% min		95% min		
Operating Temperature	120°C (H form) max				
Crosslinked	4%	8%	4%	8%	14%

Grades	RCP160M
Brand Name	Diaion
Matrix type	Highly Porous styrene, DVB R-SO <sub>3</sub> <sup>-</sup> H <sup>+</sup>
Counter Ion	H <sup>+</sup> for catalyst applications
Total Capacity (meq/ml-R)	>1.5 H form
Water Retention (%)	45-55 H form
Shipping Density (grams/liter)	~ 835 H form
Particle Size Distribution	On 710 µm: 25% max Through 250 µm: 1% max
Uniformity Coefficient	1.6 max
Whole Bead Count (%)	95% min
Operating Temperature	120°C (H form) max
Surface Area (m <sup>2</sup> /gram)	~ 50
Pore Volume (%)	0.4%



## Synthetic Adsorbents

Diaion HP20 synthetic adsorbent resin is a macroporous styrenic polymeric bead type resin designed for adsorption/desorption process scale applications. Its matrix provides an aromatic non-polar surface with excellent selectivity for hydrophobic areas of molecules, including biomolecules like antibiotics via low energy van der Waal's interactions. It is remarkable for its wide pore polymeric structure which provides excellent broad spectrum adsorption characteristics. Diaion HP21 has slightly smaller pores, and slightly higher surface area than Diaion HP20.

The Sepabeads SP825 and SP850 resins provide a smaller more uniform pore size distribution and higher surface area as compared to Diaion HP20. The increase in surface area is approximately 2x traditional adsorbents, and nearly matches the surface area of activated carbon. In many applications, this means twice the working capacity for the same volume of resin. They are recommended for industrial chemical process applications, bio/pharmaceutical applications such as desalting and extraction, and waste treatment... Sepabeads SP70 and SP700 are premium grade resins designed for the debittering of juices and related food products. These high surface area resins offer excellent kinetics and high capacity for naringin (and other bittering agents). They meet the compositional requirements for Secondary Direct Food Additives (21 CFR Section 173.65). Sepabeads SP70 is also provided pre-conditioned to meet the extractive requirements on date of manufacture.

The Sepabeads SP207 resin is a macroporous chemically modified brominated styrenic polymeric type resin. The bromination of the aromatic ring provides increased hydrophobicity, and consequently, increased selectivity for hydrophobic molecules versus conventional styrene/DVB synthetic adsorbents like Diaion HP20 resin. In addition, the bromination increases the resin density which allows for settling in fermentation broths, and for usage in upflow fluidized beds.

Diaion HP2MGL is a macroporous methacrylate polymeric resin. It has no aromatic character. Diaion HP2MGL grades have different selectivity than the classic Diaion HP20. It is recommended for broad spectrum adsorption and desorption of small and large molecules, long chain aliphatic molecules, decolorization and desalting applications, and should be evaluated as an alternate resin matrix to the styrenic based adsorbents.

Grades	HP20	HP21	SP825L	SP850	SP700
Brand Name	Diaion		Sepabeads		
Matrix type	Highly porous (styrene, DVB)				
Ceph C Capacity* (g/L)	~ 38	~ 40	~ 80	~ 85	~ 85
Water Retention (%)	55-65	45-55	52-62	46-52	60-70
Shipping Density (g/L)	~ 680	~ 685	~ 685	~ 695	~ 680
Particle Size Distribution	On 250 µm: 90% min				
Effective Size (mm)	0.25 min				
Surface Area (m <sup>2</sup> /dry-g)	~ 590	~ 640	~ 930	~ 930	~ 1200
Pore Volume (ml/gram)	~ 1.3	~ 1.3	~ 1.4	~ 1.1	~ 2.3
Average Pore Radius (Å)	290	110	70	45	90
Specific gravity	1.01				
Swelling water to toluene	30%	30%	20%	20%	7%
Operating Temperature	130°C max				

Grades	SP70	SP207	HP2MGL
Brand Name	Sepabeads		Diaion
Matrix type	Highly porous (styrene, DVB)	(brominated styrene-DVB)	(Methacrylate)
Ceph C Capacity* (g/L)	-	~ 120	< 10
Water Retention (%)	55-65	43-53	55-65
Shipping Density (g/L)	~ 685	~ 790	~ 720
Particle Size Distribution	On 250 µm: 90% min		On 355µm: 90% min
Effective Size (mm)	0.25 min		0.30 min
Surface Area (m <sup>2</sup> /dry-g)	~ 870	~ 600	~ 570
Pore Volume (ml/gram)	~ 1.5	~ 1.0	~ 1.3
Pore Radius (Å)	70	110	240
Specific gravity	1.01	1.19	1.09
Reversible Swelling % (water to toluene)	24%	20	5
Operating Temperature	130°C max		-

\* based on 4300 ppm feed loaded at 4 BV/hr (at 20 °C) to 50% leakage ( resin volume of 20 ml )

## Synthetic Adsorbents for Chromatography Separation

It is well known that smaller size resins are required to obtain higher purity and better recovery in chromatographic separation of pharmaceuticals. Mitsubishi Chemical offers several types of synthetic adsorbent grades in very useful particle size distribution for industrial scale chromatography.

HP20SS and SP20SS are directly polymerized, small particle size version of HP20. The wide pore polymer matrix provides excellent kinetics and capacity for small biomolecules of both preparative and process scale. They offer nice balance of pressure flow characteristics and true chromatographic fractionation and have also been successfully applied in simulated moving bed (SMB) applications for a variety of small biomolecules. They often compete with bonded silica supports for preparative and industrial applications.

SP2MGS is a small and uniform particle size version of methacrylate types Diaion HP2MG. It gives higher dynamic capacity than HP2MG and shows strong retention and unique selectivity in normal phase chromatography.

SP207SS is a small size version of modified aromatic type Sepabeads SP207. It is applied to reversed phase chromatography. The brominated polymeric matrix provides unique selectivity, full pH operating range and long operating life versus the conventional bonded silica packing materials used in preparative and industrial applications.

Grades	HP20SS	SP20SS	SP207SS	SP2MGS
Brand Name	Diaion		Sepabeads	
Matrix type	Highly porous (styrene, DVB)		(brominated styrene-DVB)	acrylate)
Water Retention (%)	55-67	55-65	43-53	61-69
Shipping Density (g/L)	~ 670	~ 660	~ 780	~ 720
Particle Size Distribution	>150µm:15% max 63-150µm:70% min <63µm:20% max	>75µm:30% max 63-75µm:55% min <63µm:15% max	>150µm:15% max 63-150µm:70% min <63µm:20% max	>220µm:1% max 120-160µm:85% min <90µm:1% max
Surface Area (m <sup>2</sup> /dry-g)	~ 560		~ 590	520
Pore Volume (ml/gram)	~ 1.2		~ 1.0	~ 1.3
Pore Radius (Å)	~ 290		~ 110	230
Operating Temperature	130°C max			-

## Styrenic Reversed Phase Resins

The CHP grade resins are based on highly crosslinked polystyrene matrix with no functionality. With varying the pore size, the surface area, and the bead size of these resins, the chromatographer can control the efficiency and the resolution in the separation of pharmaceuticals (e.g. heterocyclic compounds), steroids, small peptides and proteins, oligonucleotides, amphoteric molecules (e.g. sulfonamides, antibiotics, nucleic bases), basic drugs (e.g. anticonvulsants), simple amines (e.g. catecholamine), and antihistamines etc... These styrenic matrices have excellent mechanical strength with wide range pH stability (1 to 14) and resistance to high temperatures (up to 120 °C operating temperature).

CHP20 grades are the preparative size for HP20. CHP50 grades are the preparative size for HP21. CHP07 grades are the preparative size for SP207.

CSP800 is used for enrichment traces of organic compounds in environmental water with high concentration ratio and high recovery, is recommended for sample preparation for mutagenicity study. CHP85/P120 and CHP87/P120 with controlled micro-pore size, in particular, have a distinctive advantage not to adsorb high molecular weight proteins but to adsorb only low molecular weight organic compounds.

Grades	CHP50/P10	CHP50/P20	CHP20/P20	CHP50/P30	CHP20/P30
Brand Name	MCI GEL				
Matrix	Styrene-DVB				
Mean size	10 µm	20 µm		30 µm	
Particle range	9 – 11 µm	18-22 µm		20 – 40 µm	
Pore Diameter (Ang)	250		450	250	450
Column Dimension	4.6 x 150 mm 10 x 250 mm 20 x 150 mm 20 x 250 mm	None			
Packing sizes	10 g, 1000 g	25, 100, 1000ml	25, 100, 1000ml	25, 100, 1000ml	25, 100, 1000ml

Grades	CHP20/P50 dry	CHP20/P120	CSP800	CHP85/P120	CHP87/P120
Brand Name	MCI GEL				
Matrix	Styrene-DVB				
Mean size	50 µm	120 µm			
Particle range	37 – 75 µm	75 – 150 µm			
Pore Diameter (Ang)	450	-	Small	Very Small	
Column Dimension	None				
Packing sizes	100 gram	.1, .5,1,10,50L	50ml	100 ml	

Grades	CHP07/P10	CHP07/P120
Brand Name	MCI GEL	
Matrix	Brominated Styrene-DVB	
Mean size	10 µm	120 µm
Particle range	9 – 11 µm	75 – 150 µm
Pore Diameter (Ang)	250	
Column Dimension	4.6 x 150 mm 10 x 250 mm 20 x 150 mm 20 x 250 mm	None
Packing sizes	500 ml, 40 L	1,10,50L

- Note:**
- Most of the above products are available in bead sizes > 200 µm for large industrial applications. Please check the Synthetic Adsorbent section.
  - The above products are available in uniform bead sizes < 10 µm which are available in bulk or HPLC columns for small analytical applications. Please request our MCI GEL catalog of these analytical resins.

## Methacrylic Reversed Phase Resins

The CMG grade resins are based on highly crosslinked polymeth acrylic matrix with no functionality. Polymethacrylate resins have no aromatic character, offering medium hydrophobicity (less hydrophobic than styrenic resins or octadecyl silane). They are mainly used in the separation of pharmaceuticals (e.g. polyaromatic and polyaliphatic compounds), water soluble vitamins, small peptides and proteins, oligonucleotides, simple amines (e.g. catecholamine), and agricultural chemicals etc... These methacrylic matrices have excellent mechanical strength and wide range pH stability (1 to 13), and resistance to high temperatures (up to 120 °C operating temperature). CMG grades are the preparative size for HP2MG.

The CHPOD is an unusual product as it has surface hydrophobicity as well as hydrophobic functionality. It is an Octadecyl-alkylated aliphatic porous polymer which is less hydrophobic than the other CHP resin but more hydrophobic than the CMG grades.

Grades	CMG20/P10	CMG20/P30	CMG20/P150	CHPOD/P30
Brand Name	MCI GEL			
Matrix	Methacrylate			Octadecyl-Alkylated Aliphatic
Mean size	10 µm	30 µm	150 µm	30 µm
Particle range	9 – 11 µm	25 – 35 µm	150 µm	25 – 35 µm
Pore Diameter (Ång)	250			
Column Dimension	4.6 x 150 mm 10 x 250 mm 20 x 150 mm 20 x 250 mm	None		
Packing size*	10 g, 1000 g	25, 100, 1000ml	10 g,	100 g

- Note:
- a) Most of the above products are available in bead sizes > 200 µm for large industrial applications. Please check the Synthetic Adsorbent section.
  - b) The above products are available in uniform bead sizes < 10 µm which are available in bulk or HPLC columns for small analytical applications. Please request our MCI GEL catalog of these analytical resins.

## Bioseparation: Wide Pore Hydrophilic Ion Exchange Resins

Mitsubishi Chemical has launched a new series of wide pore ion exchange resins, called ChromSpeed™, for high performance protein and antibody separations. These resins are based on mono-dispersed high crosslinked polymethacrylic matrix, with a hydrophilic layer to achieve high throughput purification without surface interaction with the resin surface. These matrices are functionalized with either sulfonic acid or carboxymethyl to form strong acid and weak acid cation exchangers respectively with a sodium counter ion. These resins are easily scalable and non-compressible (rigid) with no volume change in buffer exchange. They are also characterized by their high capacity for polyclonal IgG.

Grades	S103	S101	CM103	CM101
Brand Name	ChromSpeed™			
Mean size	60 µm	30 µm	60 µm	30 µm
Particle range	Mono-dispersed (> 90% for 40 to 80 microns or 20 to 40 microns)			
Functional Group	SP		CM	
Counter Ion	Na <sup>+</sup>			
Functional degree	>0.05 meq/g		>0.08 meq/g	
Exclusion Limit	Up to 10 <sup>6</sup>			
Pore Diameter (Ang)	1000			
Human polyclonal IgG (g/L resin)	>100	>100	>90	>90
Packed Columns	1 ml available	-	1 ml available	-

The below methacrylic matrices are functionalized with either a quaternary amine (trimethyl amine) or a diethyl-aminoethyl to form strong basic and weak basic anion exchangers respectively with a chloride counter ion. These resins are easily scalable and non-compressible (rigid) with no volume change in buffer exchange. They are also characterized by their high capacity for polyclonal IgG. See below for our new anion exchange offering.

Grades	Q103	Q101	DA103	DA101
Brand Name	ChromSpeed™			
Mean size	60 µm	30 µm	60 µm	30 µm
Particle range	Mono-dispersed (> 90% for 40 to 80 microns or 20 to 40 microns)			
Functional Group	QA		DEAE	
Counter Ion	Cl <sup>-</sup>			
Functional degree	>0.05 meq/g		>0.1 meq/g	
Exclusion Limit	Up to 10 <sup>6</sup>			
Pore Diameter (Ang)	1000			
Human polyclonal IgG (g/L resin)	>100	>100	>75	>75
Packed Columns	1 ml available	-	1 ml available	-

The FPDA13 grade resin is based on highly crosslinked polymethacrylic matrix, which is hydroxylated for added hydrophilicity. The matrix is functionalized with a diethyl-amine. It is used in the large scale separation of anionic proteins, peptides, and polynucleotides (separation ran at a pH > PI of the target molecule) as well as enzyme immobilization supports. The methacrylic matrix has excellent mechanical strength with wide range pH stability (1 to 13) and resistance to high temperatures (up to 60°C operating temperature).

Grades	FP-DA13
Brand Name	Sepabeads
Mean size	120 µm
Particle range	100– 150 µm
Functional Group	Diethyl amine
Functional degree	1.90 meq/ml
Capacity BSA	15-20 mg/ml
Exclusion Limit	Up to 10 <sup>6</sup>
Pore Diameter (Ang)	600

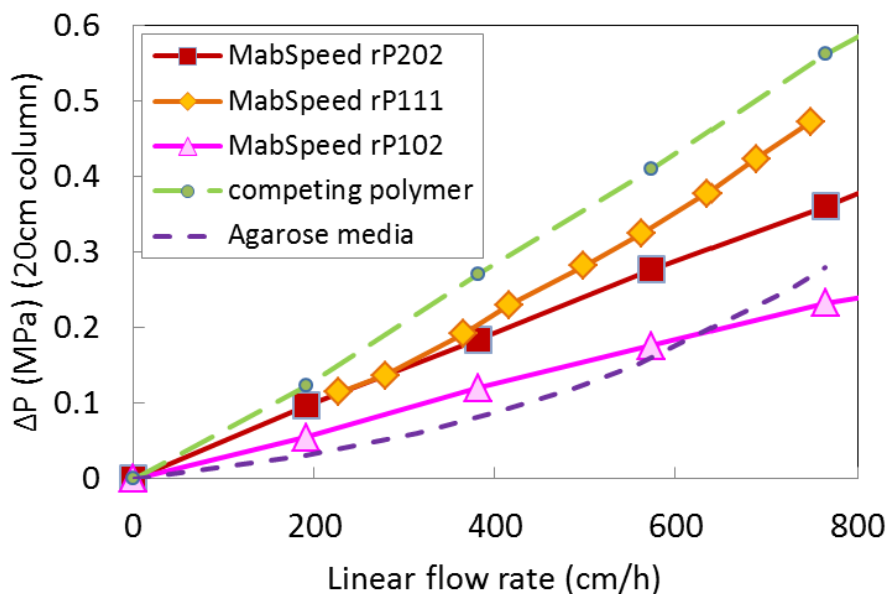
## [Affinity Resins for Antibody Purification](#)

Mitsubishi Chemical has launched a new series of wide pore polymethacrylic resin, called MabSpeed™, functionalized with a recombinant Protein A ligand for high performance antibody separations. These resins are based on mono-dispersed highly crosslinked matrix, with a hydrophilic layer to achieve high throughput purification without surface interaction with the resin surface. These resins are easily scalable and non-compressible (rigid) with no volume change during buffer exchange.

### *--- MCC rProtein-A affinity media line-up---*

Mode	Protein-A Affinity		
Product	MabSpeed™		
	rP102	rP111	rP202*
Matrix	Crosslinked Polymethacrylate		
Ligand / Functionality	rProtein-A (wild type)		rProtein-A (engineered type)
Particle Size (µm)	45	35	45
DBC (g/L-resin) 10% breakthrough, γ-globulin, r.t. 3min)	24	33	>50

### *--- Hydraulic data represents low pressure drop & easy packing ---*



\*:Pressure drop data. Data was taken with a condition of a column 20 ID x 200 mm with liquid water at temperature 25 °C.

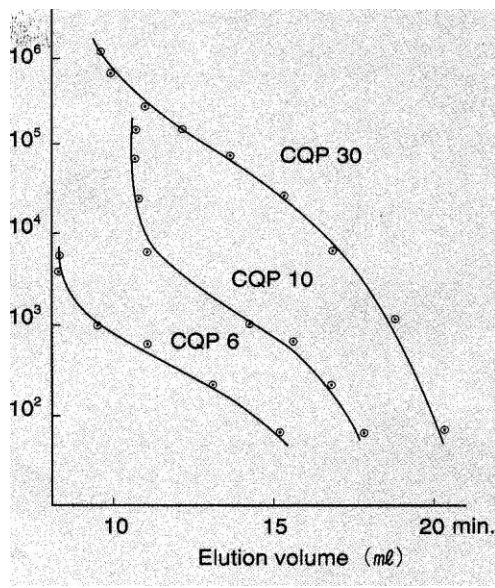
## Bioseparation: Hydrophilic Aqueous Gel Filtration Resins

The CQ grade resins are based on highly crosslinked polymethacrylic matrix, which is further hydroxylated for added hydrophilicity. These matrices are not functionalized, and have no interfering ionic interaction to achieve maximum separation by size exclusion. By varying the bead size and pore size of these resins, the chromatographer can control the efficiency and the resolution in the separation of proteins, peptides, lipids, and polynucleotides. These methacrylic matrices have excellent mechanical strength with wide range pH stability (1 to 13) and resistance to high temperatures (these resins can be autoclaved at 121°C for 20 minutes). The calibration curve for MCI GEL CQP grades is presented below.

Grades	CQP06	CQP10	CQP30	CQP30P	FP-HG13
Brand Name	MCI GEL				Sepabeads
Mean size	10 µm			30 µm	120 µm
Particle range	9 – 11 µm			25 – 35 µm	100 – 150 µm
Functional Group	Diol				
Counter Ion	None				
Exclusion Limit	Up to 1,000	Up to 10,000		Up to 10 <sup>6</sup>	
Pore Diameter (Ang)	120	200		600	
Column Dimension	7.5 x 75 mm			None	
Packing size*	10, 25, 50 g			100 ml	500 ml, 40 L

\*Larger packing sizes are available as custom packing

Molecular Weight



Conditions

Column : MCI GEL CQP06, CQP10, CQP30  
 4.5mm IDx600mmL  
 Eluent: H<sub>2</sub>O  
 Flow Rate: 1.0 ml/min  
 Column temp: ambient  
 Detection: RI  
 Sample: PEG 100µl injection

## **Remarks in handling Ion Exchange Resins**

### **Handling:**

Wear suitable personal protective equipment to prevent exposure to eyes and skin, and handle ion exchange resins at well-ventilated places from the windward. Eye-washing facilities should be set nearby. When contacted with eyes, rinse eyes with much water and consult a doctor. When swallowed, drink a lot of water and consult a doctor depending on symptoms. Spilt ion exchange resins should be collected and the floors should be cleaned, lest they may be slippery. Separate from high temperature machinery and materials, fireworks, flames, and avoid contacts and/or mixing with oxidizing materials

Sufficient care must be taken not to contact with oxidizing agents, e.g. nitric acid, since ion exchange resins may degrade or even explode when contacted with them.

### **Storage:**

Store in cool, dry, well-ventilated, and dark place. Close tightly to prevent contamination and solvent vaporization. Separate from oxidizing materials.

Ion exchange resins deteriorate fast at high temperatures and containing water may freeze and break the beads at temperatures below freezing.

### **Disposal:**

Disposal of unused ion exchange resins should be done by reclamation and/or incineration according to the instructions at the notice of handling and storage. Incineration should be implemented by incinerators that have proper facilities to treat Sox, NOx, CO, and other gases. The used ion exchange resins that adsorb heavy metals must be disposed subject to the direction of the wastes disposal and public clean laws.

### **Preparation before use:**

After filling brand new ion exchange resins into towers, backwashing and conditionings are recommended in order to eliminate the remaining elution impurities.

The backwashing and conditioning conditions vary depending on the designs and the reagents that can be applied.

There are two ways in conditioning: one is reciprocal washings with dilute acid water, e.g. 2N-HCl, and with dilute alkali water, e.g. 1N-NaOH, and the other is reciprocal flows of regenerating reagents and rinse water. The conditioning method and the number of such repetition are decided on the required quality of the treated water and other factors.

Consult the designer/engineer of your packed columns before the actual operations.

## **CONTACT INFORMATION**

Please do not hesitate to contact us when in need of samples, pricing, MSDS as well as technical information and guidance.

**ITOCHU Chemicals America Inc.**  
**360 Hamilton Avenue**  
**White Plains, NY 10601**  
**Tel: 914-333-7818**  
**Web Sites: [www.itochu-purification.com](http://www.itochu-purification.com)**  
**[www.Diaion.com](http://www.Diaion.com)**  
**email: [S&PT@itochu-ca.com](mailto:S&PT@itochu-ca.com)**